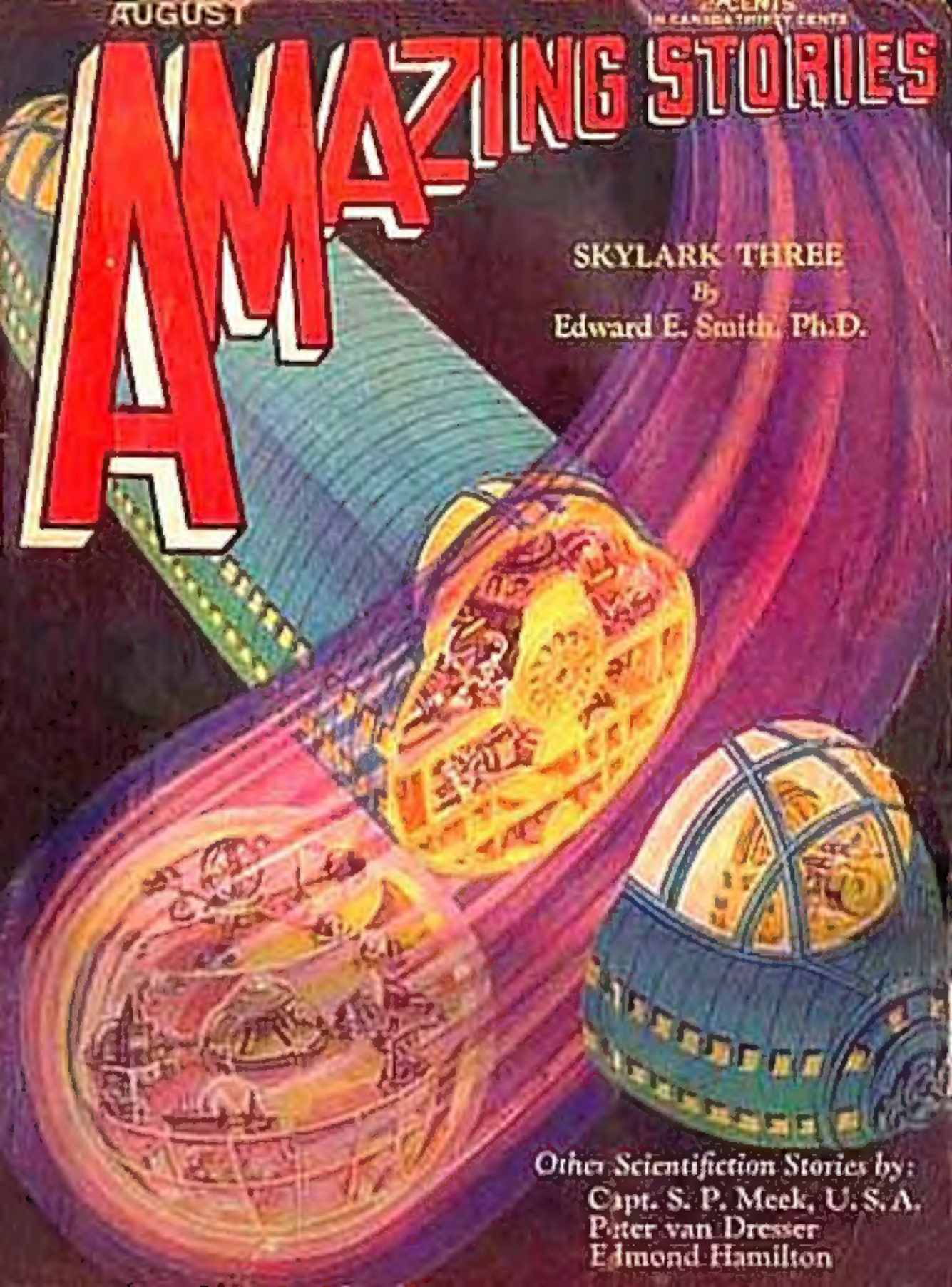
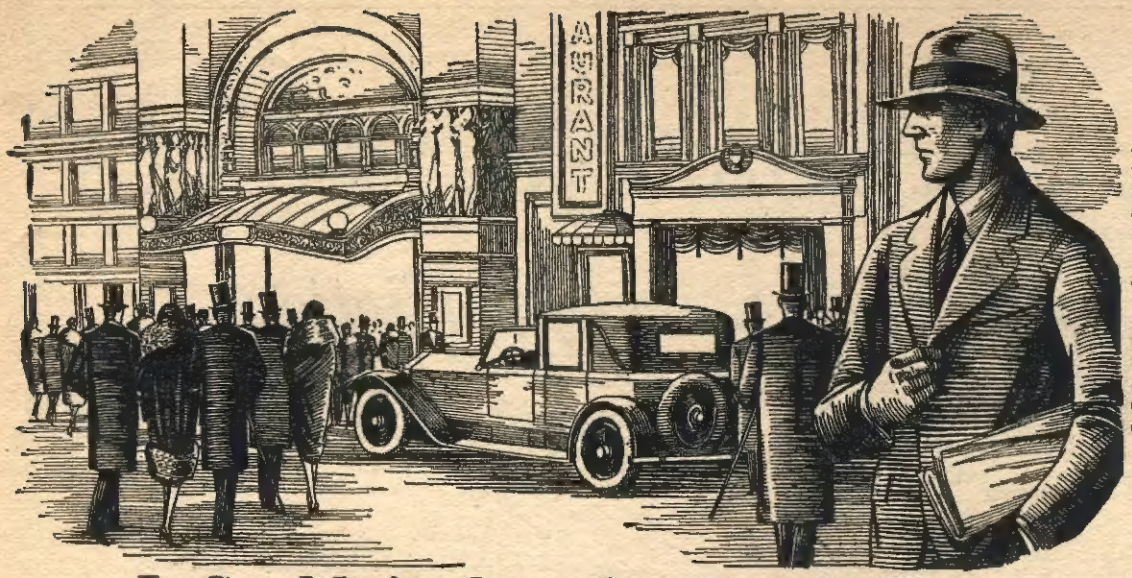
AUGUST

AMAZING STORIES

SKYLARK THREE
By
Edward E. Smith, Ph.D.



Other Scientifiction Stories by:
Capt. S. P. Meek, U. S. A.
Peter van Dresser
Edmond Hamilton



Always outside of things—that's where I was just twelve short months ago. I just didn't have the cash, that was all. No theatres, no parties, no good restaurants. No real enjoyment of life. I was just getting by, just existing. What a difference today! I drive my own car, have a good bank account, enjoy all the amusements I please.

I Couldn't Get the Good Things of Life

Then I Quit My Job and "Found" Myself!

HOW does a man go about making more money? If I asked myself that question once, I asked it a hundred times!

I know the answer now—you bet. I know the way good money is made, and I'm making it. Gone forever are the days of cheap shoes, cheap clothes, walking home to save carfare, pinching pennies to make my salary last from one pay-day to the next one. I own one of the finest Radio stores you ever saw, and I get almost all the Radio service and repair work in town. The other Radio dealers send their hard jobs to me, so you can see how I stand in my line.

But—it's just a year ago that I was a poorly paid clerk. I was struggling along on a starvation salary until by accident my eyes were opened and I saw just what was the matter with me. Here's the story of just how it happened.

One of the big moments of my life had come. I had just popped the fatal question, and Louise said, "Yes!"

Louise wanted to go in and tell her father about it right away, so we did. He sort of grunted when we told him the news, and asked Louise to leave us alone. And, my heart began to sink as I looked at his face.

"So you and Louise have decided to get married," he said to me when we were alone. "Well, Bill, just listen to me. I've watched you often here at the house with Louise and I think you are a pretty good, upstanding young fellow. I knew your father and mother, and you've always had a good reputation here, too. But just let me ask you just one question—how much do you make?"

"Twenty-eight a week," I told him.

He didn't say a word—just wrote it down on a piece of paper.

"Have you any prospects of a better job or a good raise some time soon?" he asked.

"No, sir; I can't honestly say that I have," I admitted. "I'm looking for something better all the time, though."

"Looking, eh? How do you go about it?"

Well, that question stopped me.

How did I? I was willing to take a better job if I saw the chance all right, but I certainly had laid no plans to make such a job for myself. When he saw my confusion he grunted. "I thought so," he said. Then he held up some figures he'd been scribbling at.

"I've just been figuring out your family budget, Bill, for a salary of twenty-eight a week. I've figured it several ways, so you can take your pick of the one you like best. Here's Budget No. 1: I figure you can afford a very small unfurnished apartment, make your payments on enough plain, inexpensive furniture to fix such an apartment up, pay your electricity, gas and water bills, buy just about one modest outfit of clothes for both of you once each year, and save three dollars a week for sickness, insurance, and emergencies. But you can't eat. And you'll have to go without amusements until you can get a good, substantial raise in salary."

I began to turn red as fire.

"That budget isn't so good after all," he said, glancing at me; "maybe Budget No. 2 will sound better——"

"That's enough, Mr. Sullivan," I said. "Have a heart. I can see things pretty clearly now; things I was kidding myself about before. Let me go home and think this over." And home I went, my mind in a whirl.

At home I turned the problem over and over in my mind. I'd popped the question at Louise on impulse without thinking it out. Everything Mr. Sullivan had said was gospel truth. I couldn't see anything to do, any way to turn. But I had to have more money.

I began to thumb the pages of a magazine which lay on the table beside me. Suddenly an advertisement seemed almost to leap out at my eyes, an advertisement telling of big opportunities for trained men to succeed in the great new Radio field. With the advertisement was a coupon offering a big free book full of information. I sent the coupon in, and in a few days received a handsome 64-page book, printed in two colors, telling all about the opportunities in the Radio field and how a man can prepare quickly and easily at home to take advantage of these opportunities. I read the book carefully, and when I finished it I made my decision.

What's happened in the twelve months since that day seems almost like a dream to me now. For ten of those twelve months I've had a Radio business of my own! At first, of course, I started it as a little proposition on the side, under the guidance of the National Radio Institute, the institution that gave me my Radio training. It wasn't long before I was getting so much to do in the Radio line that I quit my measly little clerical job and devoted my full time to my Radio business.

Since that time I've gone right on up, always under the watchful guidance of my friends at the National Radio Institute. They would have given me just as much help, too, if I had wanted to follow some other line of Radio besides building my own retail business, such as broadcasting, manufacturing, experimenting, sea operating, or any one of the score of lines they prepare you for. And to think that until that day I sent for their eye-opening book, I'd been wailing, "I never had a chance!"

Now I'm making real money. Louise and I have been married six months, and there wasn't any kidding about budgets by Mr. Sullivan when we stepped off, either. I'll bet that today I make more money than the old boy himself.

Here's a real tip. You may not be as bad off as I was. But, think it over—are you satisfied? Are you making enough money, at work that you like? Would you sign a contract to stay where you are now for the next ten years, making the same money? If not, you'd better be doing something about it instead of drifting.

This new Radio game is a live-wire field of golden rewards. The work, in any of the 20 different lines of Radio, is fascinating, absorbing, well paid. The National Radio Institute—oldest and largest Radio home-study school in the world—will train you inexpensively in your own home to know Radio from A to Z and to increase your earnings in the Radio field.

Take another tip—no matter what your plans are, no matter how much or how little you know about Radio—clip the coupon below and look their free book over. It is filled with interesting facts, figures, and photos, and the information it will give you is worth a few minutes of anybody's time. You will place yourself under no obligation—the book is free and is gladly sent to anyone who wants to know about Radio. Just address J. E. Smith, President, National Radio Institute. Dept. OHS, Washington, D. C.

J. E. SMITH, President,
National Radio Institute,
Dept. OHS, Washington, D. C.

Dear Mr. Smith:

Please send me your 64-page free book, printed in two colors, giving all information about the opportunities in Radio and how I can learn quickly and easily at home to take advantage of them. I understand this request places me under no obligation, and that no salesmen will call on me.

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JULES VERNE'S TOMBSTONE AT AMIENS PORTRAYING HIS IMMORTALITY

AMAZING STORIES

Scientific Fiction

Vol. 5 **August, 1930** **No. 5**

In Our Next Issue

THE TROGLODYTES, by Fred M. Barclay. Just now the daily papers are making much of the Carlsbad Cave, which has recently been discovered. Already the explorers have penetrated within 600 feet below the surface. Marvelous discoveries have been made. But the exploration continues. Who can tell what wonders greater depths might reveal. In "The Troglodytes" our new author goes deeper than the explorers and pictures in an absorbing manner many untold possibilities.

FREE ENERGY, by Harl Vincent. Power is generated now by rotating armatures of dynamos in an electric field. But earth is rotating like a gigantic armature. Electricity is everywhere in the air. Why could we not capture some of this power which circulates so freely all about us and put it to use for our own purposes? Mr. Vincent gives us some very ingenious new ideas in good scientific fiction form.

THE TRANSLATION OF JOHN FORSYTHE, by Edmund W. Putnam. When you stop to think of it, is there any really good reason why we should assume that we are the only living beings—that there is nothing beyond our vision? We can't find any. Our new author, having thought about the subject, has woven a fascinating short story around this idea.

THE PASSING STAR, by Isaac R. Nathanson. Once more this author comes forward with a short story of undisputed excellence in the field of scientific fiction. What *does* happen to shooting stars, etc.?

SKYLARK THREE (A Serial in three parts) Part II, by Edward Elmer Smith, Ph.D. After the *Skylark* is successfully launched in intergalactic space, adventures aplenty hold sway. We strongly advise a deep breath before beginning this instalment.

THE INFERIORITY COMPLEX, by Miles J. Breuer, M.D., crowded out of July issue.

And other Scientific fiction

In Our August Issue

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Our Cover

this month depicts a thrilling scene from the story entitled "Skylark Three," by Dr. Edward E. Smith, in which the *Skylark* is shown neatly cutting through the enemy vessel of the Fenechrone, inhabitants of a planet in intergalactic space.

Illustration by Wesso

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VOLUME 5

AMAZING STORIES

THE MAGAZINE OF SCIENTIFICTION

AUGUST, 1930 No. 5

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Extravagant Fiction Today - - - - - - - - - *Cold Fact Tomorrow*

The Classic Sciences

By T. O'Conor Sloane, Ph.D.

CENTURIES ago, nobody knows how many, the science of chemistry began in the laboratories of the old alchemists. They claimed or hoped that their researches would bring about the transmutation of metals and there is not the least doubt that in many cases by concealing gold in a crucible, they persuaded their patrons that they were transforming lead or other inferior substance into the precious metal. It is probably because this fraud was attempted so often, that laws were passed against alchemists, prohibiting the exercise of their alleged science. Before the age of the alchemists, as it may be termed, the old philosophers had formulated the conception of the atom, whose name is derived from the Greek and means uncutable or indivisible. The so-called atom in various forms, such as the "atom" of wood or the "atom" of iron or copper, was taken as being absolutely indestructible. Modern chemistry was born, when it was found that the "atom" of wood and of all compound substances was quite susceptible of division.

Wood can be divided into carbon, nitrogen, hydrogen and oxygen. Sugar can be divided into carbon, hydrogen and oxygen. Many of the old time atoms proved to be quite divisible, so for compound substances the atom was supplanted by the modern molecule, which is a collection of atoms. A molecule of sugar, for instance, is built up out of atoms of the three elements named above.

Chemists rested very contentedly with this as the basis of their science. The physicists of the time gave no attention to atoms or molecules, considering that they belonged entirely to the chemists; scientists, physical and chemical, led a quiet and orderly existence, the chemists developing new compounds and analyzing old ones and adding to the sum of human knowledge. But physicists after a while began to investigate the atom and for the last few decades the greatest scientific minds of the world have puzzled over what the atom is. They have evolved the theory that the atom is a highly compound thing; that it is made up of a combination of positive and negative electricities, each in the form of charges of definite amount. The atom of hydrogen was taken as consisting of one positive and one negative elemental charge of electricity. Going to the other extreme, the atom of uranium was assigned 238 charges of positive and 92 charges of external or unbound negative electricity. The negative charges, or the electrons, were taken as having hardly any weight. The atom of uranium weighs about 238 times as much as the atom of hydrogen, and was taken as having that number of charges of positive electricity in its atom. So we see what a complicated thing the atom has been theorized as being.

A portion of the negative charges, which were the electrons, according to one theory, were supposed to whirl around the central nucleus, as it is called, which was a mixture of the positive charges or protons in almost all cases holding bound within the nucleus a quantity of stationary electrons. This gave the "bound electrons," which were in the nucleus and held fast there, and what were called the "planetary electrons," which were whirling ceaselessly around the nucleus, the nucleus representing as it were the center of a little planetary system, which had one essential difference from the solar world, a difference not insisted upon as often as it should have been, to the effect that the planetary electrons whirled around in all sorts of planes, the atom having no representative of the plane of the ecliptic. Other theories rejected the idea of the revolving electrons.

It is fair to say that man has not the least conception of what electricity is. So when he builds up his atoms out of electric charges, he is reducing the world of matter to the unknown, just as truly as it was unknown in the days of Epicurus. The planetary molecule as it was called was the most interesting conception. But as man is never satisfied with the little he knows and possesses the divinely planted instinct of curiosity, he has gone on investigating and is abandoning the planetary atom as it was pictured by Bohr and has substituted for it the Schrödinger atom. This is the latest product, the successor of nearly a dozen well-known predecessors.

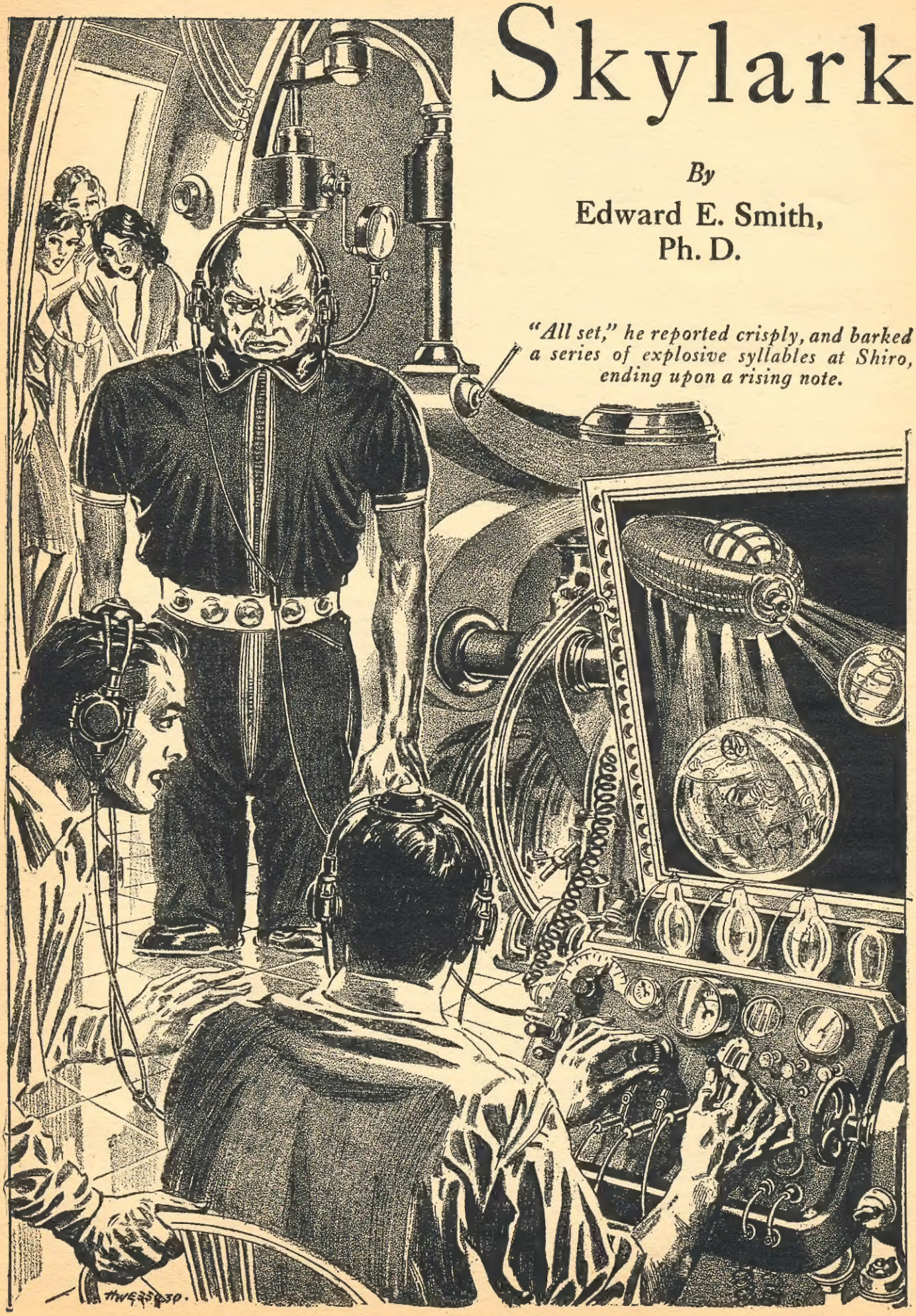
If we go into the theory of physics and chemistry, we will find that with these great developments of the last few years, the relatively comfortable old sciences in a sense have disappeared. When we speak of the great authors of Greece and Rome, the term classics is used. The same term is applied to the physics of the last generation and they are called the "classic physics." But while we are straining every nerve to keep up with the procession, as it may be termed, of modern science, it is a comfort to know that when we are analyzing in the chemical laboratories or working in mechanics and physics, we can still use the familiar "classic" sciences of twenty years ago as our tools.

The curious laws and phenomena deduced in modern physics, such as the Lorentz-Fitzgerald contraction and the change of mass with motion, do not affect us in our lives. This is because they would not be discernible except in extreme cases. At terrestrial velocities and under everyday conditions they and others also are absolutely imperceptible. The word "phenomenon" means an appearance; so literally speaking the impressive and really astonishing things in modern physics and mechanics do not appear as far as we are concerned—they can only become "phenomena" or can only "appear" under conditions entirely beyond any obtaining in our everyday life. We need not worry over the idea that we are shorter in a sleeping car when it is in motion than when it is at a station; no perceptible or measurable change can be discerned. And analogous things obtain for other things in higher science where the fourth and fifth dimensions enter into the equations.

Skylark

By

Edward E. Smith, Ph. D.



"All set," he reported crisply, and barked a series of explosive syllables at Shiro, ending upon a rising note.

Three

The Tale of the Galactic Cruise Which Ushered in Universal Civilization

Sequel to "The Skylark of Space"

AUTHOR'S NOTE:

TO all profound thinkers in the realms of Science who may chance to read SKYLARK THREE, greetings:

I have taken certain liberties with several more or less commonly accepted theories, but I assure you that those theories have not been violated altogether in ignorance. Some of them I myself believe sound, others I consider unsound, still others are out of my line, so that I am not well enough informed upon their basic mathematical foundations to have come to any definite conclusion, one way or the other. Whether or not I consider any theory sound, I did not hesitate to disregard it, if its literal application would have interfered with the logical development of the story. In "The Skylark of Space" Mrs. Garby and I decided, after some discussion, to allow two mathematical impossibilities to stand. One of these immediately became the target of critics from Maine to California and, while no astronomer has as yet called attention to the other, I would not be surprised to hear about it, even at this late date.

While I do not wish it understood that I regard any of the major features of this story as likely to become facts in the near future—indeed, it has been my aim to portray the highly improbable—it is my belief that there is no mathematical or scientific impossibility to be found in "Skylark Three."

In fact, even though I have repeatedly violated theories in which I myself believe, I have in every case taken great pains to make certain that the most rigid mathematical analysis of which I am capable has failed to show that I have violated any known and proven scientific fact. By "fact" I do not mean the kind of reasoning, based upon assumptions later shown to be fallacious, by which it was "proved" that the transatlantic cable and the airplane were scientifically impossible. I refer to definitely known phenomena which no possible future development can change—I refer to mathematical proofs whose fundamental equations and operations involve no assumptions and contain no second-degree uncertainties.

Please bear in mind that we KNOW very little. It has been widely believed that the velocity of light is the limiting velocity, and many of our leading authorities hold this view—but it cannot be proved, and is by no means universally held. In this connection, it would appear that J. J. Thompson, in "Beyond the Electron" shows, to his own satisfaction at least, that velocities vastly greater than that of light are not only possible, but necessary to any comprehensive investigation into the nature of the electron.

We do not know the nature of light. Neither the undulatory theory nor the quantum theory are adequate to explain all observed phenomena, and they seem to be mutually exclusive, since it would seem clear by definition that no one thing can be at the same time continuous and discontinuous. We know nothing of the ether—we do not even know whether or not it exists, save as a concept of our own extremely limited intelligence. We are in total ignorance of the ultimate structure of matter, and of the arrangement and significance of those larger aggregations of matter, the galaxies. We do not know nor understand, nor can we define, even such fundamental necessities as time and space.

Why prate of "the impossible"?

Edward Elmer Smith, Ph.D.

FOR two years readers of AMAZING STORIES *have literally clamored for a sequel to the famous story, "The Skylark of Space," which appeared exactly two years ago. Except that "Skylark Three" is more thrilling, more exciting and even more chockful of science than the other, Dr. Smith tells about the story in his author's note far better than we can do.*

Illustrated by WESSO

CHAPTER I

DuQuesne Goes Traveling

IN THE innermost private office of Steel, Brookings and DuQuesne stared at each other across the massive desk. DuQuesne's voice was cold, his black brows were drawn together.

"Get this, Brookings, and get it straight. I'm shoving off at twelve o'clock tonight. My advice to you is to lay off Richard Seaton, absolutely. Don't do a thing. *Nothing, hold everything.* Keep on holding it until I get back, no matter how long that may be," DuQuesne shot out in an icy tone.

"I am very much surprised at your change of front, Doctor. You are the last man I would have expected to be scared off after one engagement."

"Don't be any more of a fool than you have to, Brookings. There's a lot of difference between scared and knowing when you are simply wasting effort. As you remember, I tried to abduct Mrs. Seaton by picking her off with an attractor from a space-ship. I would have bet that nothing could have stopped me. Well, when they located me—probably with an automatic Osnomian ray-detector—and heated me red-hot while I was still better than two hundred miles up, I knew then and there that they had us stopped: that there was nothing we could do except go back to my plan, abandon the abduction idea, and eventually kill them all. Since my plan would take time, you objected to it, and sent an airplane to drop a five-hundred-pound bomb on them. Airplane, bomb, and all simply vanished. It didn't explode, you remember, just flashed into light and disappeared, with scarcely any noise. Then you pulled several more of your fool ideas, such as long-range bombardment, and

so on. None of them worked. Still you've got the nerve to think that you can get them with ordinary gunmen! I've drawn you diagrams and shown you figures—I've told you in great detail and in one-syllable words exactly what we're up against. Now I tell you again that they've *got something.* If you had the brains of a pinhead, you would know that anything I can't do with a space-ship can't be done by a mob of ordinary gangsters. I'm telling you, Brookings, that you can't do it. My way is absolutely the only way that will work."

"But five years, Doctor!"

"I may be back in six months. But on a trip of this kind anything can happen, so I am planning on being gone five years. Even that may not be enough—I am carrying supplies for ten years, and that box of mine in the vault is not to be opened until ten years from today."

"But surely we shall be able to remove the obstructions ourselves in a few weeks. We always have."

"Oh, quit kidding yourself, Brookings! This is no time for idiocy! You stand just as much chance of killing Seaton——"

"Please, Doctor, please don't talk like that!"

"Still squeamish, eh? Your pussyfooting always did give me an acute pain. I'm for direct action, word and deed, first, last, and all the time. I repeat, you have exactly as much chance of killing Richard Seaton as a blind kitten has."

"How do you arrive at that conclusion, Doctor? You seem very fond of belittling our abilities. Personally, I think that we shall be able to attain our objectives within a few weeks—certainly long before you can possibly return from such an extended trip as you have in mind. And since you are so fond of frankness, I will say that I think that Seaton has you buffaloed, as you call it. Nine-tenths of these wonderful Osnomian things, I am assured by competent authorities, are scientifically impossible, and I think that the other one-tenth exists only in your own imagination. Seaton was lucky in that the airplane bomb was defective and exploded prematurely; and your space-ship got hot because of your injudicious speed through the atmosphere. We shall have everything settled by the time you get back."

"If you have, I'll make you a present of the controlling interest in Steel and buy myself a chair in some home for feeble-minded old women. Your ignorance and unwillingness to believe any new idea do not change the facts in any particular. Even before they went to Osnome, Seaton was hard to get, as you found out. On that trip he learned so much new stuff that it is now impossible to kill him by any ordinary means. You should realize that fact when he kills every gangster you send against him. At all events be very, *very* careful not to kill his wife in any of your attacks, even by accident, until after you have killed him."

"Such an event would be regrettable, certainly, in that it would remove all possibility of the abduction."

"It would remove more than that. Remember the explosion in our laboratory, that blew an entire mountain into impalpable dust? Draw in your mind a nice, vivid picture of one ten times the size in each of our plants and in this building. I know that you are fool enough to go ahead with your own ideas, in spite of everything I've said; and, since I do not yet actually control Steel, I can't forbid you to, officially. But you should know that I know what I'm talking about, and I say again that you're going to make an utter fool of yourself; just because you won't believe anything possible, that hasn't been done every day for a hundred years. I wish that I could make you understand that Seaton and Crane have got something that we haven't—but for the good of our plants, and incidentally for your own, please remember one thing, anyway; for if you forget it, we won't have a plant left and you personally will be blown into a fine red mist. Whatever you start, kill Seaton first, and be absolutely certain that he is definitely, completely, finally and totally dead before you touch one of Dorothy Seaton's red hairs. As long as you only attack him personally he won't do anything but kill every man you send against him. If you kill her while he's still alive, though—Blooie!" and the saturnine scientist waved both hands in an expressive pantomime of wholesale destruction.

"Probably you are right in that," Brookings paled slightly. "Yes, Seaton would do just that. We shall be very careful, until after we succeed in removing him."

"Don't worry—you won't succeed. I shall attend to that detail myself, as soon as I get back. Seaton and Crane and their families, the directors and employees of their plants, the banks that by any possibility may harbor their notes or solutions—in short, every person and everything standing between me and a monopoly of 'X'—all shall disappear."

"That is a terrible program, Doctor. Wouldn't the late Perkins' plan of an abduction, such as I have in mind, be better, safer and quicker?"

"Yes—except for the fact that it will not work. I've talked until I'm blue in the face—I've proved to you over and over that you can't abduct her now without first killing him, and that you can't even touch him. My plan is the only one that will work. Seaton isn't the only one who learned anything—I learned a lot myself. I learned one thing in particular. Only four other inhabitants of either Earth or Osnome ever had even an inkling of it, and they died, with their brains disintegrated beyond reading. That thing is my ace in the hole. I'm going after it. When I get it, and not until then, will I be ready to take the offensive."

"You intend starting open war upon your return?"

"The war started when I tried to pick off the women with my attractor. That is why I am leaving at midnight. He always goes to bed at eleven-thirty, and I will be out of range of his object-compass before he wakes up. Seaton and I understand each other perfectly. We both know that the next time we meet one of us is going to be resolved into his component atoms, perhaps into electrons. He doesn't know that he's going to be the one, but I do. My final word to you is to lay off—if you don't, you and your 'competent authorities' are going to learn a lot."

"You do not care to inform me more fully as to your destination or your plans?"

"I do not. Goodbye."

CHAPTER II

Dunark Visits Earth

MARTIN CRANE reclined in a massive chair, the fingers of his right hand lightly touching those of his left, listening attentively. Richard Seaton strode up and down the room before his friend, his unruly brown hair on end, speaking savagely between

teeth clenched upon the stem of his reeking, battered briar; brandishing a sheaf of papers.

"Mart, we're stuck—stopped dead. If my head wasn't made of solid blue mush I'd have had a way figured out of this thing before now, but I can't. With that zone of force the Skylark would have everything imaginable—without it, we're exactly where we were before. That zone is immense, man—terrific—its possibilities are unthinkable—and I'm so cussed dumb that I can't find out how to use it intelligently—can't use it at all, for that matter. By its very nature it is impenetrable to any form of matter, however applied; and this calc here," shaking viciously the sheaf of papers containing his calculations, "shows that it must also be opaque to any wave whatever, propagated through air or through ether, clear down to cosmic rays. Behind it, we would be blind and helpless, so we can't use it at all. It drives me frantic! Think of a barrier of pure force, impalpable, immaterial, and exerted along a geometrical surface of no thickness whatever—and yet actual enough to stop even a Millikan ray that travels a hundred thousand light-years and then goes through twenty-seven feet of solid lead just like it was so much vacuum! That's what we're up against! However, I'm going to try out that model, Mart, right now. Come on, guy, snap into it! Let's get busy!"

"You are getting idiotic again, Dick," Crane rejoined calmly, without moving. "You know, even better than I do, that you are playing with the most concentrated essence of energy that the world has ever seen. That zone of force probably can be generated——"

"Probably, nothing!" barked Seaton. "It's just as evident a fact as that stool," kicking the unoffending bit of furniture half-way across the room as he spoke. "If you'd've let me, I'd've shown it to you yesterday!"

"Undoubtedly, then. Grant that it is impenetrable to all matter and to all known waves. Suppose that it should prove impenetrable also to gravitation and to magnetism? Those phenomena probably depend upon the ether, but we know nothing fundamental of their nature, nor of that of the ether. Therefore your calculations, comprehensive though they are, cannot predict the effect upon them of your zone of force. Suppose that that zone actually does set up a barrier in the ether, so that it nullifies gravitation, magnetism, and all allied phenomena; so that the power-bars, the attractors and repellers, cannot work through it? Then what? As well as showing me the zone of force, you might well have shown me yourself flying off into space, unable to use your power and helpless if you released the zone. No, we must know more of the fundamentals before you try even a small-scale experiment."

"Oh, bugs! You're carrying caution to extremes, Mart. What can happen? Even if gravitation should be nullified, I would rise only slowly, heading south the angle of our latitude—that's thirty-nine degrees—away from the perpendicular. I couldn't shoot off on a tangent, as some of these hot-heads have been claiming. Inertia would make me keep pace, approximately, with the earth in its rotation. I would rise slowly—only as fast as the tangent departs from the curvature of the earth's surface. I haven't figured out how fast that is, but it must be pretty slow."

"Pretty slow?" Crane smiled. "Figure it out."

"All right—but I'll bet it's slower than the rise of a toy balloon." Seaton threw down the papers and picked up his slide-rule, a twenty-inch trigonometrical duplex, "You'll concede that it is allowable to neglect the radial component of the orbital velocity of the earth for a first approximation, won't you—or shall I figure that in too?"

"You may ignore that factor."

"All right—let's see. Radius of rotation here in Washington would be cosine latitude times equatorial radius, approximately—call it thirty-two hundred miles. Angular velocity, fifteen degrees an hour. I want secant fifteen less one times thirty-two hundred. Right? Secant equals one over cosine—um-m-m-m—one point oh three five. Then point oh three five times thirty-two hundred. Hundred and twelve miles first hour. Velocity constant with respect to sun, accelerated respecting point of departure. Ouch! You win, Mart—I'd kinda step out! Well, how about this, then? I'll put on a vacuum suit and carry rations. Harness outside, with the same equipment I used in the test flights before we built *Skylark I*—*plus* the new stuff and a coil. Then throw on the zone, and see what happens. There can't be any jar in taking off, and with that outfit I can get back O.K. if I go clear to Jupiter!"

Crane sat in silence, his keen mind considering every aspect of the motions possible, of velocity, of acceleration, of inertia. He already knew well Seaton's resourcefulness in crises and his physical and mental strength.

"As far as I can see, that might be safe," he admitted finally, "and we really should know something about it besides the theory."

"Fine, Mart—let's get busy! I'll be ready in five minutes. Yell for the girls, will you? They'd break us off at the ankles if we pull anything new without letting them in on it."

A few minutes later the "girls" strolled out into Crane Field, arms around each other—Dorothy Seaton, her gorgeous auburn hair framing violent eyes and vivid coloring; black-haired, dark-eyed Margaret Crane.

"Br-r-r, it's cold!" Dorothy shivered, wrapping her coat more closely about her. "This must be the coldest day Washington has seen for years!"

"It is cold," Margaret agreed. "I wonder what they are going to do out here, this kind of weather?"

AS SHE spoke, the two men stepped out of the "testing shed"—the huge structure that housed their Osnomian-built space-cruiser, "Skylark II." Seaton waddled clumsily, wearing as he did a Crane vacuum-suit which, built of fur, canvas, metal and transparent silica, braced by steel netting and equipped with air-tanks and heaters, rendered its wearer independent of outside conditions of temperature and pressure. Outside this suit he wore a heavy harness of leather, buckled about his body, shoulders, and legs, attached to which were numerous knobs, switches, dials, bakelite cases, and other pieces of apparatus. Carried by a strong aluminum framework in turn supported by the harness, the universal bearing of a small power-bar rose directly above his grotesque-looking helmet.

"What do you think you're going to do in that thing, Dickie?" Dorothy called. Then, knowing that he could not hear her voice, she turned to Crane. "What are you letting that precious husband of mine do now, Martin? He looks as though he were up to something."

While she was speaking, Seaton had snapped the release of his face-plate.

"Nothing much, Dottie. Just going to show you-all the zone of force. Mart wouldn't let me turn it on,

unless I got all cocked and primed for a year's journey into space."

"Dot, what is that zone of force, anyway?" asked Margaret.

"Oh, it's something Dick got into his head during that awful fight they had on Osnome. He hasn't thought of anything else since we got back. You know how the attractors and repellers work? Well, he found out something funny about the way everything acted while the Mardonalians were bombarding them with a certain kind of a wave-length. He finally figured out the exact ray that did it, and found out that if it is made strongly enough, it acts as if a repeller and attractor were working together—only so much stronger that nothing can get through the boundary, either way—in fact, it's so strong that it cuts anything in two that's in the way. And the funny thing is that there's nothing there at all, really; but Dick says that the forces meeting there, or something, make it act as though something really important were there. See?"

"Uh-huh," assented Margaret, doubtfully, just as Crane finished the final adjustments and moved toward them. A safe distance away from Seaton, he turned and waved his hand.

Instantly Seaton disappeared from view, and around the place where he had stood there appeared a shimmering globe some twenty feet in diameter—a globe apparently a perfect spherical mirror, which darted upward and toward the south. After a moment the globe disappeared and Seaton was again seen. He was now standing upon a hemispherical mass of earth. He darted back toward the group upon the ground, while the mass of earth fell with a crash a quarter of a mile away. High above their heads the mirror again encompassed Seaton, and again shot upward and southward. Five times this maneuver was repeated before Seaton came down, landing easily in front of them and opening his helmet.

"It's just what we thought it was, only worse," he reported tersely. "Can't do a thing with it. Gravitation won't work through it—bars won't—nothing will. And dark? *Dark!* Folks, you ain't never seen no darkness, nor heard no silence. It scared me stiff!"

"Poor little boy—afraid of the dark!" exclaimed Dorothy. "We saw absolute blackness in space."

"Not like this, you didn't. I just saw absolute darkness and heard absolute silence for the first time in my life. I never imagined anything like it—come on up with me and I'll show it to you."

"No you won't!" his wife shrieked as she retreated toward Crane. "Some other time, perhaps."

Seaton removed the harness and glanced at the spot from which he had taken off, where now appeared a hemispherical hole in the ground.

"Let's see what kind of tracks I left, Mart," and the two men bent over the depression. They saw with astonishment that the cut surface was perfectly smooth, with not even the slightest roughness or irregularity visible. Even the smallest loose grains of sand had been sheared in two along a mathematically exact hemispherical surface by the inconceivable force of the disintegrating copper bar.

"Well, that sure wins the——"

An alarm bell sounded. Without a glance around, Seaton seized Dorothy and leaped into the testing shed. Dropping her unceremoniously to the floor he stared through the telescope sight of an enormous ray-generator which had automatically aligned itself upon the distant point of liberation of intra-atomic energy which had caused the alarm to sound. One hand upon the switch, his face was hard and merciless as he waited to make sure of the identity of the approaching space-ship, before he released the frightful power of his generator upon it.

"I've been expecting DuQuesne to try it again," he gritted, striving to make out the visitor, yet more than two hundred miles distant. "He's out to get you, Dot—and this time I'm not just going to warm him up and scare him away, as I did last time. This time that misguided mutt's going to get frizzled right . . . I can't locate him with this small telescope, Mart. Line him up in the big one and give me the word, will you?"

"I see him, Dick, but it is not DuQuesne's ship. It is built of transparent arenak, like the 'Kondal.' Even though it seems impossible, I believe it is the 'Kondal'."

"Maybe so, and again maybe DuQuesne built it—or stole it. On second thought, though, I don't believe that DuQuesne would be fool enough to tackle us again in the same way—but I'm taking no chances . . . O.K., it is the 'Kondal,' I can see Dunark and Sitar myself, now."

The transparent vessel soon neared the field and the four Terrestrials walked out to greet their Osnomian friends. Through the arenak walls they recognized Dunark, Kofedix of Kondal, at the controls, and saw Sitar, his beautiful young queen, lying in one of the seats near the wall. She attempted a friendly greeting, but her face was strained as though she were laboring under a burden too great for her to bear.

As they watched, Dunark slipped a helmet over his head and one over Sitar's, pressed a button to open one of the doors, and supported her toward the opening.

"They musn't come out, Dick!" exclaimed Dorothy in dismay. "They'll freeze to death in five minutes without any clothes on!"

"Yes, and Sitar can't stand up under our gravitation, either—I doubt if Dunark can, for long," and Seaton dashed toward the vessel, motioning the visitor back.

But misunderstanding the signal, Dunark came on. As he clambered heavily through the door he staggered as though under an enormous weight, and Sitar collapsed upon the frozen ground. Trying to help her, half-kneeling over her, Dunark struggled, his green skin paling to a yellowish tinge at the touch of the bitter and unexpected cold. Seaton leaped forward and gathered Sitar up in his mighty arms as though she were a child.

"Help Dunark back in, Mart," he directed crisply. "Hop in, girls—we've got to take these folks back up where they can live."

Seaton shut the door, and as everyone lay flat in the seats Crane, who had taken the controls, applied one notch of power and the huge vessel leaped upward. Miles of altitude were gained before Crane brought the cruiser to a stop and locked her in place with an anchoring attractor.

"There," he remarked calmly, "gravitation here is approximately the same as it is upon Osnome."

"Yes," put in Seaton, standing up and shedding clothing in all directions, "and I rise to remark that we'd better undress as far as the law allows—perhaps farther. I never did like Osnomian ideas of comfortable warmth, but we can endure it by peeling down to bedrock——"

SITAR jumped up happily, completely restored, and the three women threw their arms around each other.

"What a horrible, terrible, frightful world!" exclaimed Sitar, her eyes widening as she thought of her first experience with our earth. "Much as I love you, I shall never dare try to visit you again. I have never been able to understand why you Terrestrials wear what you call 'clothes,' nor why you are so terribly, brutally strong. Now I really know—I will feel the utterly cold and savage embrace of that awful earth of yours as long as I live!"

"Oh, it's not so bad, Sitar." Seaton, who was shaking both of Dunark's hands vigorously, assured her over his shoulder. "All depends on where you were raised. We like it that way, and Osnome gives us the pip. But you poor fish," turning again to Dunark, "with all my brains inside your skull, you should have known what you were letting yourself in for."

"That's true, after a fashion," Dunark admitted, "but your brain told me that Washington was *hot*. If I'd have thought to recalculate your actual Fahrenheit degrees into our loro . . . but that figures only forty-seven and, while very cold, we could have endured it —wait a minute, I'm getting it. You have what you call 'seasons.' This, then, must be your 'winter.' Right?"

"Right the first time. That's the way your brain works behind my pan, too. I could figure anything out all right after it happened, but hardly ever beforehand —so I guess I can't blame you much, at that. But what I want to know is, how'd you get here? It would take more than my brains—you can't see our sun from anywhere near Osnome, even if you knew exactly where to look for it."

"Easy. Remember those wrecked instruments you threw out of *Skylark I* when we built *Skylark II?*" Having every minute detail of the configuration of Seaton's brain engraved upon his own, Dunark spoke English in Seaton's own characteristic careless fashion. Only when thinking deeply or discussing abstruse matter did Seaton employ the carefully selected and precise phrasing, which he knew so well how to use. "Well, none of them was beyond repair and the juice was still on most of them. One was an object-compass bearing on the Earth. We simply fixed the bearings, put on some minor improvements, and here we are."

"Let us all sit down and be comfortable," he continued, changing into the Kondalian tongue without a break, "and I will explain why we have come. We are in most desperate need of two things which you alone can supply—salt, and that strange metal, 'X'. Salt I know you have in great abundance, but I know that you have very little of the metal. You have only the one compass upon that planet?"

"That's all—one is all we set on it. However, we've got close to half a ton of the metal on hand—you can have all you want."

"Even if I took it all, which I would not like to do, that would be less than half enough. We must have at least one of your tons, and two tons would be better."

"Two tons! Holy cat! Are you going to plate a fleet of battle cruisers?"

"More than that. We must plate an area of copper of some ten thousand square miles—in fact, the very life of our entire race depends upon it."

"It's this way," he continued, as the four earth-beings stared at him in wonder. "Shortly after you left Osnome we were invaded by the inhabitants of the third planet of our fourteenth sun. Luckily for us they landed upon Mardonale, and in less than two days there was not a single Osnomian left alive upon that half of the planet. They wiped out our grand fleet in one brief engagement, and it was only the *Kondal* and a few more like her that enabled us to keep them from crossing the ocean. Even with our full force of these vessels, we cannot defeat them. Our regular Kondalian weapons were useless. We shot explosive copper charges against them of such size as to cause earthquakes all over Osnome, without seriously crippling their defenses. Their offensive weapons are almost irresistible—they have generators that burn arenak as though it were so much paper, and a series of deadly frequencies against which only a copper-driven ray screen is effective, and even that does not stand up long."

"How come you lasted till now, then?" asked Seaton.

"They have nothing like the *Skylark*, and no knowledge of intra-atomic energy. Therefore their space-ships are of the rocket type, and for that reason they can cross only at the exact time of conjunction, or whatever you call it—no, not conjunction, exactly, either, since the two planets do not revolve around the same sun: but when they are closest together. Our solar system is so complex, you know, that unless the trips are timed exactly, to the hour, the vessels will not be able to land upon Osnome, but will be drawn aside and be lost, if not actually drawn into the vast central sun. Although it may not have occurred to you, a little reflection will show that the inhabitants of all the central planets, such as Osnome, must perforce be absolutely ignorant of astronomy, and of all the wonders of outer space. Before your coming we knew nothing beyond our own solar system, and very little of that. We knew of the existence of only such of the closest planets as were brilliant enough to be seen in our continuous sunlight, and they were few. Immediately after your coming I gave your knowledge of astronomy to a group of our foremost physicists and mathematicians, and they have been working ceaselessly from space-ships—close enough so that observations could be recalculated to Osnome, and yet far enough away to afford perfect 'seeing,' as you call it."

"But I don't know any more about astronomy than a pig does about Sunday," protested Seaton.

"Your knowledge of details is, of course, incomplete," conceded Dunark, "but the detailed knowledge of the best of your Earthly astronomers would not help us a great deal, since we are so far removed from you in space. You, however, have a very clear and solid knowledge of the fundamentals of the science, and that is what we need, above all things."

"Well, maybe you're right, at that. I do know the general theory of the motions, and I studied some Celestial Mechanics. I'm awfully weak on advanced theory, though, as you'll find out when you get that far."

"Perhaps—but since our enemies have no knowledge of astronomy whatever, it is not surprising that their rocket-ships can be launched only at one particularly favorable time; for there are many planets and satellites, of which they can know nothing, to throw their vessels off the course.

"Some material essential to the operation of their war machinery apparently must come from their own planet, for they have ceased attacking, have dug in,

and are simply holding their ground. It may be that they had not anticipated as much resistance as we could offer with space-ships and intra atomic energy. At any rate, they have apparently saved enough of that material to enable them to hold out until the next conjunction —I cannot think of a better word for it—shall occur. Our forces are attacking constantly, with all the armament at our command, but it is certain that if the next conjunction is allowed to occur, it means the end of the entire Kondalian nation."

"What d'you mean 'if the next conjunction is *allowed* to occur?'" interjected Seaton. "Nobody can stop it."

"I am stopping it," Dunark stated quietly, grim purpose in every lineament. "That conjunction shall never occur. That is why I must have the vast quantities of salt and 'X'. We are building abutments of arenak upon the first satellite of our seventh planet, and upon our sixth planet itself. We shall cover them with plated active copper, and install chronometers to throw the switches at precisely the right moment. We have calculated the exact times, places, and magnitudes of the forces to be used. We shall throw the sixth planet some distance out of its orbit, and force the first satellite of the seventh planet clear out of that planet's influence. The two bodies whose motions we have thus changed will collide in such a way that the resultant body will meet the planet of our enemies in head-on collision, long before the next conjunction. The two bodies will be of almost equal masses, and will have opposite and approximately equal velocities; hence the resultant fused or gaseous mass will be practically without velocity and will fall directly into the fourteenth sun."

"Wouldn't it be easier to destroy it with an explosive copper bomb?"

"Easier, yes, but much more dangerous to the rest of our solar system. We cannot calculate exactly the effect of the collisions we are planning—but it is almost certain that an explosion of sufficient violence to destroy all life upon the planet would disturb its motion sufficiently to endanger the entire system. The way we have in mind will simply allow the planet and one satellite to drop out quietly—the other planets of the same sun will soon adjust themselves to the new conditions, and the system at large will be practically unaffected—at least, so we believe."

Seaton's eyes narrowed as his thoughts turned to the quantities of copper and "X" required and to the engineering features of the project; Crane's first thought was of the mathematics involved in a computation of that magnitude and character; Dorothy's quick reaction was one of pure horror.

"He can't, Dick! He mustn't! It would be too ghastly! It's outrageous—it's unthinkable—it's—it's—it's simply too horrible!" Her violet eyes flamed, and Margaret joined in:

"That would be awful, Martin. Think of the destruction of a whole planet—of an entire world—with all its inhabitants! It makes me shudder, even to think of it."

DUNARK leaped to his feet, ablaze. But before he could say a word, Seaton silenced him.

"Shut up, Dunark! Pipe down! Don't say anything you'll be sorry for—let *me* tell 'em! Close your mouth, I tell you!" as Dunark still tried to get a word in, "I tell you I'll tell 'em, and when I tell 'em they stay told! Now listen, you two girls—you're going off half-cocked and you're both full of little red ants. What do you think Dunark is up against? Sherman chirped it when he described war—and this is a real he-war; a brand totally unknown on our Earth. It isn't a question of whether or not to destroy a population—the only question is which population is to be destroyed. One of them's got to go. Remember those folks go into a war thoroughly, and there isn't a thought, even remotely resembling our conception of mercy in any of their minds on either side. If Dunark's plans go through, the enemy nation will be wiped out. That is horrible, of course. But on the other hand, if we block him off from salt and 'X,' the entire Kondalian nation will be destroyed just as thoroughly and efficiently, and even more horribly—not one man, woman, or child would be spared. Which nation do you want saved? Play that over a couple of times on your adding machine, Dot, and let me know what you get."

Dorothy, taken aback, opened and closed her mouth twice before she found her voice.

"But, Dick, they couldn't possibly. Would they kill them *all*, Dick? Surely they wouldn't—they *couldn't*."

"Surely they would—and could. They do—it's good technique in those parts of the Galaxy. Dunark has just told us of how they killed every member of the entire race of Mardonalians, in forty hours. Kondal would go the same way. Don't kid yourself, Dimples—don't be a child. War up there is *no* species of pink tea, believe me—half of my brain has been through thirty years of Osnomian warfare, and I know precisely what I'm talking about. Let's take a vote. Personally, I'm in favor of Osnome. Mart?"

"Osnome."

"Dottie? Peggy?" Both remained silent for some time, then Dorothy turned to Margaret.

"You tell him, Peggy—we both feel the same way."

"Dick, you know that we wouldn't want the Kondalians destroyed—but the other is so—such a—well, such an utter *shrecklichkeit*—isn't there some other way out?"

"I'm afraid not—but if there is any other possible way out, I'll do my da— to help find it," he promised. "The ayes have it. Dunark, we'll skip over to that 'X' planet and load you up."

Dunark grasped Seaton's hand. "Thanks, Dick," he said, simply. "But before you help me farther, and lest I might be in some degree sailing under false colors, I must tell you that, wearer of the seven disks though you are, Overlord of Osnome though you are, my brain brother though you are; had you decided against me, nothing but my death could have kept me away from that salt and your 'X' compass."

"Why sure," assented Seaton, in surprise. "Why not? Fair enough! Anybody would do the same—don't let that bother you."

"How is your supply of platinum?" asked Dunark.

"Mighty low. We had about decided to hop over there after some. I want some of your textbooks on electricity and so on, too. I see you brought a load of platinum with you."

"Yes, a few hundred tons. We also brought along an assortment of books I knew you would be interested in, a box of radium, a few small bags of gems of various kinds, and some of our fabrics, Sitar thought your Karfediro would like to have. While we are here, I would like to get some books on chemistry and some other things."

"We'll get you the Congressional Library, if you want

Trying to help her, half kneeling over her, Dunark struggled, his green skin paling to a yellowish tinge at the touch of the bitter and unexpected cold.

it, and anything else you think you'd like. Well, gang, let's go places and do things! What to do, Mart?"

"We had better drop back to Earth, have the laborers unload the platinum, and load on the salt, books, and other things. Then both ships will go to the 'X' planet, as we will each want compasses on it, for future use. While we are loading, I should like to begin remodeling our instruments; to make them something like these; with Dunark's permission. These instruments are wonders, Dick—vastly ahead of anything I have ever seen. Come and look at them, if you want to see something really beautiful."

"Coming up. But say, Mart, while I think of it, we mustn't forget to install a zone-of-force apparatus on this boat, too. Even though we can't use it intelligently, it certainly would be a winner as a defense. We couldn't hurt anybody through it, of course, but if we should happen to be getting licked anywhere, all we'd have to do would be to wrap ourselves up in it. They couldn't touch us. Nothing in the ether spectrum is corkscrewy enough to get through it."

"That's the second idea you've had since I've known you, Dicky," Dorothy smiled at Crane. "Do you think he should be allowed to run at large, Martin?"

"That is a real idea. We may need it—you never can tell. Even if we never find any other use for the zone of force, that one is amply sufficient to justify its installation."

"Yes, it would be, for you—and I'm getting to be a regular Safety-First Simon myself, since they opened up on us. What about those instruments?"

THE three men gathered around the instrument-board and Dunark explained the changes he had made—and to such men as Seaton and Crane it was soon evident that they were examining an installation embodying sheer perfection of instrumental control—a system which only those wonder instrument-makers, the Osnomians, could have devised. The new object-compasses were housed in arenak cases after setting, and the housings were then exhausted to the highest attainable vacuum. Oscillation was set up by means of one carefully standardized electrical impulse, instead of by the clumsy finger-touch Seaton had used. The bearings, built of arenak and Osnomian jewels, were as strong as the axles of a truck and yet were almost perfectly frictionless.

"I like them myself," admitted Dunark. "Without a load the needles will rotate freely more than a thousand hours on the primary impulse, as against a few minutes in the old type; and under load they are many thousands of times as sensitive."

"You're a blinding flash and a deafening report, ace!" declared Seaton, enthusiastically. "That compass is as far ahead of my model as the *Skylark* is ahead of Wright's first glider."

The other instruments were no less noteworthy. Dunark had adopted the Perkins telephone system, but had improved it until it was scarcely recognized and had made it capable of almost unlimited range. Even the guns—heavy rapid-firers, mounted in spherical bearings in the walls—were aimed and fired by remote control, from the board. He had devised full automatic steering controls; and meters and recorders for acceleration, velocity, distance, and flight-angle. He had perfected a system of periscopic vision, which enabled the pilot to see the entire outside surfaces of the shell, and to look toward any point of the heavens without interference.

"This kind of takes my eye, too, prince," Seaton said, as he seated himself, swung a large, concave disk in front of him, and experimented with levers and dials. "You certainly can't call this thing a periscope—it's no more a periscope than I am a polyp. When you look through this plate, it's better than looking out of a window—it subtends more than the angle of vision, so that you can't see anything but out-of-doors—I thought for a second I was going to fall out. What do you call 'em, Dunark?"

"Kraloto. That would be in English . . . Seeing-plate? Or rather, call it 'visiplate'."

"That's a good word. Mart, take a look if you want to see a set of perfect lenses and prisms."

Crane looked into the visiplate and gasped. The vessel had disappeared—he was looking directly down upon the Earth below him!

"No trace of chromatic, spherical, or astigmatic aberration," he reported in surprise. "The refracting system is invisible—it seems as though nothing intervenes between the eye and the object. You perfected all these things since we left Osnome, Dunark? You are in a class by yourself. I could not even copy them in less than a month, and I never could have invented them."

"I did not do it alone, by any means. The Society of Instrument-Makers, of which I am only one member, installed and tested more than a hundred systems. This one represents the best features of all the systems tried. It will not be necessary for you to copy them. I brought along two complete duplicate sets for the *Skylark*, as well as a dozen or so of the compasses. I thought that perhaps these particular improvements might not have occurred to you, since you Terrestrials are not as familiar as we are with complex instrumental work."

Crane and Seaton spoke together.

"That was thoughtful of you, Dunark, and we appreciated it fully."

"That puts four more palms on your *Croix de Guerre*, ace. Thanks a lot."

"Say, Dick," called Dorothy, from her seat near the wall. "If we're going down to the ground, how about Sitar?"

"By lying down and not doing anything, and by staying in the vessel, where it is warm, she will be all right for the short time we must stay here," Dunark answered for his wife. "I will help all I can, but I do not know how much that will be."

"It isn't so bad lying down," Sitar agreed. "I don't like your Earth a bit, but I can stand it a little while. Anyway, I *must* stand it, so why worry about it?"

"'At-a-girl!" cheered Seaton. "And as for you, Dunark, you'll pass the time just like Sitar does—lying down. If you do much chasing around down there where we live, you're apt to get your lights and liver twisted all out of shape—so you'll stay put, horizontal. We've got men enough around the shop to eat this cargo in three hours, let alone unload it. While they unload and load you up, we'll install the zone apparatus, put a compass on you, put one of yours on us, and then you can hop back up here where you're comfortable. Then as soon as we can get the 'Lark' ready for the trip, we'll jump up here and be on our way. Everything clear? Cut the rope, Mart—let the old bucket drop!"

CHAPTER III

Skylark Two Sets Out

SAY, Mart, I just got conscious! It never occurred to me until just now, as Dunark left, that I'm as good an instrument-maker as Dunark is—the same one, in fact—and I've got a hunch. You know that needle on DuQuesne hasn't been working for quite a while? Well, I don't believe it's out of commission at all. I think he's gone somewhere, so far away that it can't read on him. I'm going to house it in, re-jewel it, and find out where he is."

"An excellent idea. He has even you worrying, and as for myself——"

"Worrying! That bird is simply pulling my cork! I'm so scared he'll get Dottie, that I'm running around in circles and biting myself in the small of the back. He's got a hen on, you can bet your shirt on that—what gravels me is he's aiming at the girls, not at us or the job."

"I should say that someone had aimed at you fairly accurately, judging by the number of bullets stopped lately by that arenak armor of yours. I wish that I could take some of the strain, but they are centering all their attacks upon you."

"Yes—I can't stick my nose outside our yard without somebody throwing lead at it. It's funny, too. You're more important to the power-plant than I am."

"You should know why. They are not afraid of me. While my spirit is willing enough, it was your skill and rapidity with a pistol that frustrated four attempts at abduction in as many days. It is positively uncanny, the way you explode into action. With all my practice, I didn't even have my pistol out yesterday until it was all over. And besides Prescott's guards, we had four policemen with us—detailed to 'guard' us—because of the number of gunmen you had to kill before that!"

"It ain't practice so much, Mart—it's a gift. I've always been fast, and I react automatically. You think first, that's why you're slow. Those cops were funny. They didn't know what it was all about until it was all over—all but calling the wagon. That was the worst yet. One of their slugs struck directly in front of my left eye—it was kinda funny, at that, seeing it splash—and I thought I was inside a boiler in a riveting shop when those machine-guns cut loose. It was hectic, all right, while it lasted. But one thing I'll tell the attentive world—we're not doing all the worrying. Very few, if any, of the gangsters they send after us are getting back. Wonder what they think when they shoot at us and we don't drop?

"But I'm afraid I'm beginning to crack, Mart," Seaton went on, his voice becoming grimly earnest. "I don't like anything about this whole mess. I don't like all four of us wearing armor all the time. I don't like living constantly under guard. I don't like all this killing. And this constant menace of losing Dorothy, if I let her out of my sight for five seconds, is driving me mad. To tell you the real truth, I'm devilishly afraid that they'll figure out something that'll work. I could grab off two women, or kill two men, if they had armor and guns enough to stock a war. I believe that DuQuesne could, too—and the rest of that bunch aren't imbeciles, either, by any means. I won't feel safe until all four of us are in the *Skylark* and a long ways from here. I'm sure glad we're pulling out; and I don't intend to come back until I get a good line on DuQuesne. He's the bird I'm going to get, and get right—and when I get him I'll tell the cock-eyed world he'll *stay* got. There won't be any two atoms of his entire carcass left in the same township. I meant that promise when I gave it to him!"

"He realizes that fully. He knows that it is now definitely either his life or our own, and he is really dangerous. When he took Steel over and opened war upon us, he did it with his eyes wide open. With his ideas, he must have a monopoly of 'X' or nothing; and he knows the only possible way of getting it. However, you and I both know that he would not let either one of us live, even though we surrendered."

"You chirped it! But that guy's going to find he's started something, unless I get paralysis of the intentions. Well, how about turning up a few R. P. M.? We don't want to keep Dunark waiting too long."

"There is very little to do beyond installing the new instruments; and that is nearly done. We can finish pumping out the compass *en route*. You have already installed every weapon of offense and defense known to either Earthly or Osnomian warfare, including those ray-generators and screens you moaned so about not having during the battle over Kondal. I believe that we have on board every article for which either of us has been able to imagine even the slightest use."

"Yes, we've got her so full of plunder that there's hardly room left for quarters. You ain't figuring on taking anybody but Shiro along, are you?"

"No. I suppose there is no real necessity for taking even him, but he wants very much to go, and may prove himself useful."

"I'll say he'll be useful. None of us really enjoys polishing brass or washing dishes—and besides, he's one star cook and an A-1 housekeeper."

THE installation of the new instruments was soon completed, and while Dorothy and Margaret made last-minute preparations for departure, the men called a meeting of the managing directors and department heads of the "Seaton-Crane Co., Engineers." The chiefs gave brief reports in turn. Units Number One and Number Two of the immense new central super-power plant were in continuous operation. Number Three was almost ready to cut in. Number Four was being rushed to completion. Number Five was well under way. The research laboratory was keeping well up on its problems. Troubles were less than had been anticipated. Financially, it was a gold mine. With no expense for boilers or fuel, and thus with a relatively small investment in plant and a very small operating cost, they were selling power at one-sixth of prevailing rates, and still profits were almost paying for all new construction. With the completion of Number Five, rates would be reduced still further.

"In short, Dad, everything's slick," remarked Seaton to Mr. Vaneman, after the others had gone.

"Yes; your plan of getting the best men possible, paying them well, and giving them complete authority and sole responsibility, has worked to perfection. I have never seen an undertaking of such size go forward so smoothly and with such fine co-operation."

"That's the way we wanted it. We hand-picked the directors, and put it up to you, strictly. You did the same to the managers. Everybody knows that his end is up to him, and him alone—so he digs in."

"However, Dick, while everything at the works is so fine, when is this other thing going to break?"

"We've won all the way so far, but I'm afraid something's about due. That's the big reason I want to get Dot away for a while. You know what they're up to?"

"Too well," the older man answered. "Dottie or Mrs. Crane, or both. Her mother—she is telling her goodbye now—and I agree that the danger here is greater than out there."

"Danger out there? With the old can fixed the way she is now, Dot's a lot safer there than you are in bed. Your house might fall down, you know."

"You're probably right, son—I know you, and I know Martin Crane. Together, and in the *Skylark*, I believe you invincible."

"All set, Dick?" asked Dorothy, appearing in the doorway.

"All set. You've got the dope for Prescott and everybody, Dad. We may be back in six months, or we may see something to investigate, and be gone a year or so. Don't begin to lose any sleep until after we've been out—oh, say three years. We'll make it a point to be back by then."

Farewells were said; the party embarked, and *Skylark Two* shot upward. Seaton flipped a phone set over his head and spoke.

"Dunark! . . . Coming out, heading directly for 'X'. . . . No, better stay quite a ways off to one side when we get going good. . . . Yes, I'm accelerating twenty six point oh oh oh. . . . Yes, I'll call you now and then, until the radio waves get lost, to check the course with you. After that, keep on the last course, reverse at the calculated distance, and by the time we're pretty well slowed down, we'll feel around for each other with the compasses and go in together. . . . Right. . . . Uh-huh. . . . Fine! So long!"

In order that the two vessels should keep reasonably close together, it had been agreed that each should be held at an acceleration of exactly twenty-six feet per second, positive and negative. This figure represented a compromise between the gravitational forces of the two worlds upon which the different parties lived. While considerably less than the acceleration of gravitation at the surface of the Earth, the Terrestrials could readily accustom themselves to it; and it was not enough greater than that of Osnome to hamper seriously the activities of the green people.

Well clear of the Earth's influence, Seaton assured himself that everything was functioning properly, then stretched to his full height, wreathed his arms over his head, and heaved a deep sigh of relief.

"Folks," he declared, "This is the first time I've felt right since we got out of this old bottle. Why, I feel so good a cat could walk up to me and scratch me right in the eye, and I wouldn't even scratch back. Yowp! I'm a wild Siberian catamount, and this is my night to howl. Whee-ee-yerow!"

Dorothy laughed, a gay, lilting carol.

"Haven't I always told you he had cat blood in him, Peggy? Just like all tomcats, every once in a while he has to stretch his claws and yowl. But go ahead, Dickie, I like it—this is the first uproar you've made in weeks. I believe I'll join you!"

"It most certainly is a relief to get this load off our minds: I could do a little ladylike yowling myself," Margaret said; and Crane, lying completely at ease, a thin spiral of smoke curling upward from his cigarette, nodded agreement.

"Dick's yowling is quite expressive at times. All of us feel the same way, but some of us are unable to express ourselves quite so vividly. However, it is past bedtime, and we should organize our crew. Shall we do it as we did before?"

"No, it isn't necessary. Everything is automatic. The bar is held parallel to the guiding compass, and signal bells ring whenever any of the instruments show a trace of abnormal behavior. Don't forget that there is at least one meter registering and recording every factor of our flight. With this control system we can't get into any such jam as we did last trip."

"Surely you are not suggesting that we run all night with no one at the controls?"

"Exactly that. A man camping at this board is painting the lily and gilding fine gold. Awake or asleep, nobody need be closer to it than is necessary to hear a bell if one should ring, and you can hear them all over the ship. Furthermore, I'll bet a hat we won't hear a signal a week. Simply as added precaution, though, I've run lines so that any time one of these signals lets go, it sounds a buzzer on the head of our bed; so I'm automatically taking the night shift. Remember, Mart, these instruments are thousands of times as sensitive as the keenest human senses—they'll spot trouble long before we could, even if we were looking right at it."

"Of course, you understand these instruments much better than I do, as yet. If you trust them, I am perfectly willing to do the same. Goodnight."

SEATON sat down and Dorothy nestled beside him, her head snuggled into the curve of his shoulder.

"Sleepy, cuddle-pup?"

"Heavens, no! I couldn't sleep now, lover—could you?"

"Not any. What's the use?"

His arm tightened around her. Apparently motionless to its passengers, the cruiser bored serenely on into space, with ever-mounting velocity. There was not the faintest sound, not the slightest vibration—only the peculiar violet glow surrounding the shining copper cylinder in its massive universal bearing gave any indication of the thousands of kilowatts being generated in that mighty intra-atomic power-plant. Seaton studied it thoughtfully.

"You know, if that violet aura and copper bar were a little different in shade and tone of color, they'd be just like your eyes and hair," he remarked finally.

"You burn me up, Dick!" she retorted, her entrancing low chuckle bubbling through her words. "You do say the weirdest things at times! Possibly they would—and if the moon were made of different stuff than it is and had a different color, it might be green cheese, too! What say we go over and look at the stars?"

"As you were, Rufus!" he commanded sternly. "Don't move a millimeter—you're a drive fit, right where you are. I'll get you any stars you want, and bring them right in here to you. What constellation would you like? I'll get you the Southern Cross—we never see it in Washington."

"No, I want something familiar; the Pleiades or the Big Dipper—no, get me Canis Major—'where Sirius, brightest jewel in the diadem of the firmament, holds

sway'," she quoted. "There! Thought I'd forgotten all the astronomy you ever taught me, didn't you? Think you can find it?"

"Sure. Declination about minus twenty, as I remember it, and right ascension between six and seven hours. Let's see—where would that be from our course?"

He thought for a moment, manipulated several levers and dials, snapped off the lights, and swung number one exterior visiplate around, directly before their eyes.

"Oh . . . Oh . . . this is magnificent, Dick!" she exclaimed. "It's stupendous. It seems as though we were right out there in space itself, and not in here at all. It's . . . it's just too perfectly darn wonderful!"

Although neither of them was unacquainted with interstellar space, it presents a spectacle that never fails to awe even the most seasoned observer; and no human being had ever before viewed the wonders of space from such a coign of vantage. Thus the two fell silent and awed as they gazed out into the abysmal depths of the interstellar void. The darkness of Earthly night is ameliorated by light-rays scattered by the atmosphere; the stars twinkle and scintillate and their light is diffused, because of the same medium. But here, what a contrast! They saw the utter, absolute darkness of the complete absence of all light; and upon that indescribable blackness they beheld superimposed the almost unbearable brilliance of enormous suns concentrated into mathematical points, dimensionless. Sirius blazed in blue-white splendor, dominating the lesser members of his constellation, a minute but intensely brilliant diamond upon a field of black velvet—his refulgence unmarred by any trace of scintillation or distortion.

As Seaton slowly shifted the field of vision, angling toward and across the celestial equator and the ecliptic, they beheld in turn mighty Rigel; The Belt, headed by dazzlingly brilliant-white Delta-Orionis: red Betelguese: storied Aldebaran, the friend of mariners: and the astronomically constant Pleiades.

Seaton's arm contracted, swinging Dorothy into his embrace; their lips met and held.

"Isn't it wonderful, lover," she murmured, "to be out here in space this way, together, away from all our troubles and worries? I am so happy."

"It's all of that, sweetheart mine!"

"I almost died, every time they shot at you. Suppose your armor cracked or something? I wouldn't want to go on living—I'd just naturally die!"

"I'm glad it didn't—and I'm twice as glad that they didn't succeed in grabbing you away from me. . . ." His jaw set rigidly, his gray eyes became hard as tempered drills. "Blackie DuQuesne has something coming to him. So far, I have always paid my debts. . . . I shall settle with him. . . . IN FULL."

"That was an awfully quick change of subject," he continued, his voice changirg instantly into a lighter vein, "but that's one penalty of being human. We can't live in high altitudes all our lives—if we could there would be no thrill in ascending them so often.

"Yes, we love each other just the same—more than anybody else I ever heard of." After a moment she eyed him shrewdly and continued:

"You've got something on your mind besides that tangled mop of hair, big boy. Tell it to Red-Top."

"Nothing much. . . ."

"Come on, 'fess up—it's good for the soul. You can't fool your own wife, guy; I know your little winning ways too well."

"Let me finish, woman; I was about to bare my very soul. To resume—nothing much to go on but a hunch, but I think DuQuesne's somewhere out here in the great open spaces, where men are sometimes schemers as well as men; and if so, I'm after him—foot, horse, and marines."

"That object compass?"

"Yes. You see, I built that thing myself, and I know darn well it isn't out of order. It's still on him, but doesn't indicate. Ergo, he is too far away to reach—and with his weight, I could find him anywhere up to about one and a half light-years. If he wants to go that far away from home, where is his logical destination? It can't be anywhere but Osnome, since that is the only place we stopped at for any length of time—the only place where he could have learned anything. He's learned something, or found something useful to him there, just as we did. That is certain, since he is not the type of man to do anything without a purpose. Uncle Dudley is on his trail—and will be able to locate him pretty soon."

"When will you get that new compass-case exhausted to a skillionth of a whillimeter or something, whatever it is? I thought Dunark said it took five hundred hours of pumping to get it where he wanted it?"

"It did him—but while the Osnomians are wonders at some things, they're not so hot at others. You see, I've got three pumps on that job, in series. First, a Rodebush-Michalek super-pump* then, backing that, an ordinary mercury-vapor pump, and last, backing both the others, a Cenco-Hyvac motor-driven oil pump. In less than fifty hours that case will be as empty as a flapper's skull. Just to make sure of cleaning up the last infinitesimal traces, though, I'm going to flash a getter charge of tantalum in it. After that, the atmosphere in that case will be tenuous—take my word for it."

"I'll have to; most of that contribution to science being over my head like a circus tent. What say we let *Skylark Two* drift by herself for a while, and catch us some of Nature's sweet restorer?"

CHAPTER IV

The Zone of Force Is Tested

SEATON strode into the control room with a small oblong box in his hand. Crane was seated at the desk, poring over an abstruse mathematical treatise in *Science*. Margaret was working upon a bit of embroidery. Dorothy, seated upon a cushion on the floor with one foot tucked under her, was reading, her hand straying from time to time to a box of chocolates conveniently near.

"Well, this is a peaceful, home-like scene—too bad to bust it up. Just finished sealing off and flashing out this case, Mart. Going to see if she'll read. Want to take a look?"

He placed the compass upon the plane table, so that its final bearing could be read upon the master circles controlled by the gyroscopes; then simultaneously started his stop-watch and pressed the button which caused a minute couple to be applied to the needle. Instantly the needle began to revolve, and for many minutes there was no apparent change in its motion in either the primary or secondary bearings.

"Do you suppose it is out of order, after all?" asked Crane, regretfully.

* J. Am. Chem. Soc. 51: 3, 750.

"I don't think so," Seaton pondered. "You see, they weren't designed to indicate such distances on such small objects as men, so I threw a million ohms in series with the impulse. That cuts down the free rotation to less than half an hour, and increases the sensitivity to the limit. There, isn't she trying to quit it?"

"Yes, it is settling down. It must be on him still."

Finally the ultra-sensitive needle came to rest. When it had done so, Seaton calculated the distance, read the direction, and made a reading upon Osnome.

"He's there, all right. Bearings agree, and distances check to within a light-year, which is as close as we can hope to check on as small a mass as a man. Well, that's that—nothing to do about it until after we get there. One sure thing, Mart—we're not coming straight back home from 'X'."

"No, an investigation is indicated."

"Well, that puts me out of a job. What to do? Don't want to study, like you. Can't crochet, like Peg. Darned if I'll sit cross-legged on a pillow and eat candy, like that Titian blonde over there on the floor. I know what —I'll build me a mechanical educator and teach Shiro to talk English instead of that mess of language he indulges in. How'd that be, Mart?"

"Don't do it," put in Dorothy, positively. "He's just too perfect, the way he is. Especially don't do it if he'd talk the way you do—or could you teach him to talk the way you write?"

"Ouch! That's a dirty dig. However, Mrs. Seaton, I am able and willing to defend my customary mode of speech. You realize that the spoken word is ephemeral, whereas the thought, whose nuances have once been expressed in imperishable print is not subject to revision—its crudities can never be remodeled into more subtle, more gracious shading. It is my contention that, due to these inescapable conditions, the mental effort necessitated by the employment of nice distinctions in sense and meaning of words and a slavish adherence to the dictates of the more precise grammarians should be reserved for the print. . . ."

He broke off as Dorothy, in one lithe motion, rose and hurled her pillow at his head.

"Choke him, somebody! Perhaps you had better build it, Dick, after all."

"I believe that he would like it, Dick. He is trying hard to learn, and the continuous use of a dictionary is undoubtedly a nuisance to him."

"I'll ask him. Shiro!"

"You have call, sir?" Shiro entered the room from his galley, with his unfailing bow.

"Yes. How'd you like to learn to talk English like Crane there does—without taking lessons?"

Shiro smiled doubtfully, unable to take such a thought seriously.

"Yes, it can be done," Crane assured him. "Doctor Seaton can build a machine which will teach you all at once, if you like."

"I like, sir, enormously, yes, sir. I years study and pore, but honorable English extraordinary difference from Nipponese—no can do. Dictionary useful but . . . " he flipped pages dexterously, "extremely cumbrous. If honorable Seaton can do, shall be extreme . . . gratification."

He bowed again, smiled, and went out.

"I'll do just that little thing. So long, folks, I'm going up to the shop."

DAY after day the *Skylark* plunged through the vast emptiness of the interstellar reaches. At the end of each second she was traveling exactly twenty-six feet per second faster than she had been at its beginning; and as day after day passed, her velocity mounted into figures which became meaningless, even when expressed in thousands of miles per second. Still she seemed stationary to her occupants, and only different from a vessel motionless upon the surface of the Earth in that objects within her hull had lost three-sixteenths of their normal weight. Acceleration, too, had its effect. Only the rapidity with which the closer suns and their planets were passed gave any indication of the frightful speed at which they were being hurtled along by the inconceivable power of that disintegrating copper bar.

When the vessel was nearly half-way to "X," the bar was reversed in order to change the sign of their acceleration, and the hollow sphere spun through an angle of one hundred and eighty degrees around the motionless cage which housed the enormous gyroscopes. Still apparently motionless and exactly as she had been before, the *Skylark* was now actually traveling in a direction which seemed "down" and with a velocity which was being constantly decreased by the amount of their negative acceleration.

A few days after the bar had been reversed Seaton announced that the mechanical educator was complete, and brought it into the control room.

In appearance it was not unlike a large radio set, but it was infinitely more complex. It possessed numerous tubes, kino-lamps, and photo-electric cells, as well as many coils of peculiar design—there were dozens of dials and knobs, and a multiple set of head-harnesses.

"How can a thing like that possibly work as it does?" asked Crane. "I know that it does work, but I could scarcely believe it, even after it had educated me."

"That is nothing like the one Dunark used, Dick," objected Dorothy. "How come?"

"I'll answer you first, Dot. This is an improved model—it has quite a few gadgets of my own in it. Now, Mart, as to how it works—it isn't so funny after you understand it—it's a lot like radio in that respect. It operates on a band of frequencies lying between the longest light and heat waves and the shortest radio waves. This thing here is the generator of those waves and a very heavy power amplifier. The headsets are stereoscopic transmitters, taking or receiving a three-dimensional view. Nearly all matter is transparent to those waves; for instance bones, hair, and so on. However, cerebin, a cerebroside peculiar to the thinking structure of the brain, is opaque to them. Dunark, not knowing chemistry, didn't know why the educator worked or what it worked on—he found out by experiment that it did work; just as we found out about electricity. This three-dimensional model, or view, or whatever you want to call it, is converted into electricity in the headsets, and the resulting modulated wave goes back to the educator. There it is heterodyned with another wave—this second frequency was found after thousands of trials and is, I believe, the exact frequency existing in the optic nerves themselves—and sent to the receiving headset. Modulated as it is, and producing a three-dimensional picture, after rectification in the receiver, it reproduces exactly what has been 'viewed,' if due allowance has been made for the size and configuration of the different brains involved in the transfer. You remember a sort of flash—a

sensation of seeing something—when the educator worked on you? Well, you did see it, just as though it had been transmitted to the brain by the optic nerve, but everything came at once, so the impression of sight was confused. The result in the brain, however, was clear and permanent. The only drawback is that you haven't the visual memory of what you have learned, and that sometimes makes it hard to use your knowledge. You don't know whether you know anything about a certain subject or not until after you go digging around in your brain looking for it."

"I see," said Crane, and Dorothy, the irrepressible, put in:

"Just as clear as so much mud. What are the improvements you added to the original design?"

"Well, you see, I had a big advantage in knowing that cerebrin was the substance involved, and with that knowledge I could carry matters considerably farther than Dunark could in his original model. I can transfer the thoughts of somebody else to a third party or to a record. Dunark's machine couldn't work against resistance—if the subject wasn't willing to give up his thoughts he couldn't get them. This one can take them away by force. In fact, by increasing plate and grid voltages in the amplifier, I can pretty nearly burn out a man's brain. Yesterday, I was playing with it, transferring a section of my own brain to a magnetized tape—for a permanent record, you know—and found out that above certain rather low voltages it becomes a form of torture that would make the best efforts of the old Inquisition seem like a petting party."

"Did you succeed in the transfer?" Crane was intensely interested.

"Sure. Push the button for Shiro, and we'll start something."

"Put your heads against this screen," he directed when Shiro had come in, smiling and bowing as usual. "I've got to caliper your brains to do a good job."

The calipering done, he adjusted various dials and clamped the electrodes over his own head and over the heads of Crane and Shiro.

"Want to learn Japanese while we're at it, Mart? I'm going to."

"Yes, please. I tried to learn it while I was in Japan, but it was altogether too difficult to be worth while."

Seaton threw in a switch, opened it, depressed two more, opened them, and threw off the power.

"All set," he reported crisply, and barked a series of explosive syllables at Shiro, ending upon a rising note.

"Yes, sir," answered the Japanese. "You speak Nipponese as though you had never spoken any other tongue. I am very grateful to you, sir, that I may now discard my dictionary."

"How about you two girls—anything you want to learn in a hurry?"

"Not me!" declared Dorothy emphatically. "That machine is too darn weird to suit me. Besides, if I knew as much about science as you do, we'd probably fight about it."

"I do not believe I care to . . . " began Margaret.

She was interrupted by the penetrating sound of an alarm bell.

"That's a new note!" exclaimed Seaton, "I never heard that note before."

He stood in surprise at the board, where a brilliant purple light was flashing slowly. "Great Cat! That's a purely Osnomian war-gadget—kind of a battleship detector—shows that there's a boatload of bad news around here somewhere. Grab the visiplates quick, folks," as he rang Shiro's bell. "I'll take visiplate area one, dead ahead. Mart, take number two. Dot, three; Peg, four; Shiro, five. Look sharp! . . . Nothing in front. See anything, any of you?"

NONE of them could discover anything amiss, but the purple light continued to flash, and the bell to ring. Seaton cut off the bell.

"We're almost to 'X'," he thought aloud. "Can't be more than a million miles or so, and we're almost stopped. Wonder if somebody's there ahead of us? Maybe Dunark is doing this, though. I'll call him and see." He threw in a switch and said one word—"Dunark!"

"Here!" came the voice of the Kofedix from the speaker. "Are you generating?"

"No—just called to see if you were. What do you make of it?"

"Nothing as yet. Better close up?"

"Yes, edge over this way and I'll come over to meet you. Leave your negative as it is—we'll be stopped directly. Whatever it is, it's dead ahead. It's a long ways off yet, but we'd better get organized. Wouldn't talk much, either—they may intercept our wave, narrow as it is."

"Better yet, shut off your radio entirely. When we get close enough together, we'll use the hand-language. You may not know that you know it, but you do. Turn your heaviest searchlight toward me—I'll do the same."

There was a click as Dunark's power was shut off abruptly, and Seaton grinned as he cut his own.

"That's right, too, folks. In Osnomian battles we always used a sign-language when we couldn't hear anything—and that was most of the time. I know it as well as I know English, now that I am reminded of the fact."

He shifted his course to intercept that of the Osnomian vessel. After a time the watchers picked out a minute point of light, moving comparatively rapidly against the stars, and knew it to be the searchlight of the *Kondal*. Soon the two vessels were almost side by side, moving cautiously forward, and Seaton set up a sixty-inch parabolic reflector, focused upon a coil. As they went on, the purple light continued to flash more and more rapidly, but still nothing was to be seen.

"Take number six visiplate, will you, Mart? It's telescopic, equivalent to a twenty-inch refractor. I'll tell you where to look in a minute—this reflector increases the power of the regular indicator." He studied meters and adjusted dials. "Set on nineteen hours forty-three minutes, and two hundred seventy-one degrees. He's too far away yet to read exactly, but that'll put him in the field of vision."

"Is this radiation harmful?" asked Margaret.

"Not yet—it's too weak. Pretty soon we may be able to feel it; then I'll throw out a screen against it. When it's strong enough, it's pretty deadly stuff. See anything, Mart?"

"I see something, but it is very indistinct. It is moving in sharper now. Yes, it is a space-ship, shaped like a dirigible airship."

"See it yet, Dunark?" Seaton signaled.

"Just sighted it. Ready to attack?"

"I am not. I'm going to run. Let's go, and go fast!"

Dunark signaled violently, and Seaton shook his head time after time, stubbornly.

"A difficulty?" asked Crane.

"Yes. He wants to go jump on it, but I'm not looking for trouble with any such craft as that—it must be a thousand feet long and is certainly neither Terrestrial nor Osnomian. I say beat it while we're all in one piece. How about it?"

"Absolutely," concurred Crane and both women.

The bar was reversed and the *Skylark* leaped away. The *Kondal* followed, although the observers could see that Dunark was raging. Seaton swung number six visiplate around, looked once, and switched on the radio.

"Well, Dunark," he said grimly. "You get your wish. That bird is coming out, with at least twice the acceleration we could get with both motors full on. He saw us all the time, and was waiting for us."

"Go on—get away if you can. You can stand a higher acceleration than we can. We'll hold him as long as possible."

"I would, if it would do any good, but it won't. He's so much faster than we are that he could catch us anyway, if he wanted to, no matter how much of a start we had—and it looks now as though he wanted us. Two of us stand a lot better chance than one of licking him if he's looking for trouble. Spread out a mile or two, and pretend this is all the speed we've got. What'll we give him first?"

"Give him everything at once. Rays six, seven, eight, nine, and ten. . . ." Crane, with Seaton, began making contacts, rapidly but with precision. "Heat wave two-seven. Induction, five-eight. Oscillation, everything under point oh six three. All the explosive copper we can get in. Right?"

"Right—and if worse comes to worst, remember the zone of force. Let him shoot first, because he may be peaceable—but it doesn't look like olive branches to me."

"Got both your screens out?"

"Yes. Mart, you might take number two visiplate and work the guns—I'll handle the rest of this stuff. Better strap yourselves in solid, folks—this may develop into a kind of rough party, by the looks of things right now."

AS he spoke, a pyrotechnic display enveloped the entire ship as a radiation from the foreign vessel struck the other neutralizing screen and dissipated its force harmlessly in the ether. Instantly Seaton threw on the full power of his refrigerating system and shot in the master switch that actuated the complex offensive armament of his dreadnought of the skies. An intense, livid violet glow hid completely main and auxiliary power bars, and long flashes leaped between metallic objects in all parts of the vessel. The passengers felt each hair striving to stand on end as the very air became more and more highly charged—and this was but the slight corona-loss of the frightful stream of destruction being hurled at the other space-cruiser, now scarcely a mile away!

Seaton stared into number one visiplate, manipulating levers and dials as he drove the *Skylark* hither and yon, dodging frantically, the while the automatic focusing devices remained centered upon the enemy and the enormous generators continued to pour forth their deadly frequencies. The bars glowed more fiercely as they were advanced to full working load—the stranger was one blaze of incandescent ionization, but she still fought on; and Seaton noticed that the pyrometers recording the temperature of the shell were mounting rapidly, in spite of the refrigerators.

"Dunark, put everything you've got upon one spot—right on the end of his nose!"

As the first shell struck the mark, Seaton concentrated every force at his command upon the designated point. The air in the *Skylark* crackled and hissed and intense violet flames leaped from the bars as they were driven almost to the point of disruption. From the forward end of the strange craft there erupted prominence after prominence of searing, unbearable flame as the terrific charges of explosive copper struck the mark and exploded, liberating instantaneously their millions upon millions of kilowatt-hours of intra-atomic energy. Each prominence enveloped all three of the fighting vessels and extended for hundreds of miles out into space—but still the enemy warship continued to hurl forth solid and vibratory destruction.

A brilliant orange light flared upon the panel, and Seaton gasped as he swung his visiplate upon his defenses, which he had supposed impregnable. His outer screen was already down, although its mighty copper generator was exerting its utmost power. Black areas had already appeared and were spreading rapidly, where there should have been only incandescent radiance; and the inner screen was even now radiating far into the ultra-violet and was certainly doomed. Knowing as he did the stupendous power driving those screens, he knew that there were superhuman and inconceivable forces being directed against them, and his right hand flashed to the switch controlling the zone of force. Fast as he was, much happened in the mere moment that passed before his flying hand could close the switch. In the last infinitesimal instant of time before the zone closed in, a gaping black hole appeared in the incandescence of the inner screen, and a small portion of a ray of energy so stupendous as to be palpable, struck, like a tangible projectile, the exposed flank of the *Skylark*. Instantly the refractory arenak turned an intense, dazzling white and more than a foot of the forty-eight-inch skin of the vessel melted away, like snow before an oxy-acetylene flame: melting and flying away in molten globes and sparkling gases—the refrigerating coils lining the hull were of no avail against the concentrated energy of that titanic thrust. As Seaton shut off his power, intense darkness and utter silence closed in, and he snapped on the lights.

"They take one trick!" he blazed, his eyes almost emitting sparks, and leaped for the generators. He had forgotten the efforts of the zone of force, however, and only sprawled grotesquely in the air until he floated within reach of a line.

"Hold everything, Dick!" Crane snapped, as Seaton bent over one of the bars. "What are you going to do?"

"I'm going to put as heavy bars in these ray-generators as they'll stand and go out and get that bird. We can't lick him with Osnomian rays or with our explosive copper, but I can carve that sausage into slices with a zone of force, and I'm going to do it."

"Steady, old man—take it easy. I see your point, but remember that you must release the zone of force before you can use it as a weapon. Furthermore, you must discover his exact location, and must get close enough to him to use the zone as a weapon, all without its protection. Can those ray-screens be made sufficiently powerful to withstand the beam they employed last, even for a second?"

"Hm . . . m . . . m. Never thought of that, Mart,"

Seaton replied, the fire dying out of his eyes. "Wonder how long the battle lasted?"

"Eight and two-tenths seconds, from first to last, but they had had that heavy ray in action only a fraction of one second when you cut in the zone of force. Either they underestimated our strength at first, or else it required about eight seconds to tune in their heavy generators—probably the former."

"But we've *got* to do something, man! We can't just sit here and twiddle our thumbs!"

"Why, and why not? That course seems eminently wise and proper. In fact, at the present time, thumb-twiddling is distinctly indicated."

"Oh, you're full of little red ants! We can't do a thing with that zone on—and you say just sit here. Suppose they know all about that zone of force? Suppose they can crack it? Suppose they ram us?"

"I shall take up your objections in order," Crane had lighted a cigarette and was smoking meditatively. "First, they may or may not know about it. At present, that point is immaterial. Second, whether or not they know about it, it is almost a certainty that they cannot crack it. It had been up for more than three minutes, and they have undoubtedly concentrated everything possible upon us during that time. It is still standing. I really expected it to go down in the first few seconds, but now that it has held this long it will, in all probability, continue to hold indefinitely. Third, they most certainly will not ram us, for several reasons. They probably have encountered few, if any, foreign vessels able to stand against them for a minute, and will act accordingly. Then, too, it is probably safe to assume that their vessel is damaged, to some slight extent at least; for I do not believe that any possible armament could withstand the forces you directed against them and escape entirely unscathed. Finally, if they did ram us, what would happen? Would we feel the shock? That barrier in the ether seems impervious, and if so, it could not transmit a blow. I do not see exactly how it would affect the ship dealing the blow. You are the one who works out the new problems in unexplored mathematics—some time you must take a few months off and work it out."

"Yes, it would take that long, too, I guess—but you're right, he can't hurt us. That's using the old bean, Mart! I was going off half-cocked again, darn it! I'll pipe down, and we'll go into a huddle."

SEATON noticed that Dorothy's face was white and that she was fighting for self-control. Drawing himself over to her, he picked her up in a tight embrace.

"Cheer up, Red-Top! This man's war ain't started yet!"

"Not started? What do you mean? Haven't you and Martin just been admitting to each other that you can't do anything? Doesn't that mean that we are beaten?"

"Beaten! Us? How do you get that way? Not on your sweet young life!" he ejaculated, and the surprise on his face was so manifest that she recovered instantly. "We've just dug a hole and pulled the hole in after us, that's all! When we get everything doped out to suit us, we'll snap out of it and that bird'll think he's been petting a wildcat!"

"Mart, you're the thinking end of this partnership," he continued, thoughtfully. "You've got the analytical mind and the judicial disposition, and can think circles around me. From what little you've seen of those folks, tell me who, what, and where they are. I'm getting the germ of an idea, and maybe we can make it work."

"I will try it." Crane paused. "They are, of course, neither from the Earth nor from Osnome. It is also evident that they have solved the secret of intra-atomic energy. Their vessels are not propelled as ours are—they have so perfected that force that it acts upon every particle of the structure and its contents. . . ."

"How do you figure that?" blurted Seaton.

"Because of the acceleration they can stand. Nothing even semi-human, and probably nothing living, could endure it otherwise. Right?"

"Yes—I never thought of that."

"Furthermore, they are far from home, for if they were from anywhere nearby, the Osnomians would have known of them—particularly since it is evident from the size of the vessel that it is not a recent development with them, as it is with us. Since the green system is close to the center of the Galaxy, it seems reasonable, as a working hypothesis, to assume that they are from some system far from the center, perhaps close to the outer edge. They are very evidently of a high degree of intelligence. They are also highly treacherous and merciless. . . ."

"Why?" asked Dorothy, who was listening eagerly.

"I deduce those characteristics from their unprovoked attack upon peaceful ships, vastly smaller and supposedly of inferior armament; and also from the nature of that attack. This vessel is probably a scout or an exploring ship, since it seems to be alone. It is not altogether beyond the bounds of reason to imagine it upon a voyage of discovery, in search of new planets to be subjugated and colonized. . . ."

"That's a sweet picture of our future neighbors—but I guess you're hitting the old nail on the head, at that."

"If these deductions are anywhere nearly correct, they are terrible neighbors. For my next point, are we justified in assuming that they do or do not know about the zone of force?"

"That's a hard one. Knowing what they evidently do know, it's hard to see how they could have missed it. And yet, if they had known about it for a long time, wouldn't they be able to get through it? Of course it may be a real and total barrier in the ether—in that case they'd know that they couldn't do a thing as long as we keep it on. Take your choice, but I believe that they know about it, and know more than we do—that it is a total barrier set up in the ether."

"I agree with you, and we shall proceed upon that assumption. They know, then, that neither they nor we can do anything as long as we maintain the zone—that it is a stalemate. They also know that it takes an enormous amount of power to keep the zone in place. Now we have gone as far as we can go upon the meager data we have—considerably farther than we really are justified in going. We must now try to come to some conclusion concerning their present activities. If our ideas as to their natures are even approximately correct, they are waiting, probably fairly close at hand, until we shall be compelled to release the zone, no matter how long that period of waiting shall be. They know, of course, from our small size, that we cannot carry enough copper to maintain it indefinitely, as they could. Does that sound reasonable?"

"I check you to nineteen decimal places, Mart, and from your ideas I'm getting surer and surer that we can pull their corks. I can get into action in a hurry when

I have to, and my idea now is to wait until they relax a trifle, and then slip a fast one over on them. One more bubble out of the old think-tank and I'll let you off for the day. At what time will their vigilance be at lowest ebb? That's a poser, I'll admit, but the answer to it may answer everything—the first shot will, of course, be the best chance we'll ever have."

"Yes, we should succeed in the first attempt. We have very little information to guide us in answering that question." He studied the problem for many minutes before he resumed, "I should say that for a time they would keep all their rays and other weapons in action against the zone of force, expecting us to release it immediately. Then, knowing that they were wasting power uselessly, they would cease attacking, but would be very watchful, with every eye fastened upon us and with every weapon ready for instant use. After this period of vigilance, regular ship's routine would be resumed. Half the force, probably, would go off duty—for, if they are even remotely like any organic beings with which we are familiar, they require sleep or its equivalent at intervals. The men on duty—the normal force, that is—would be doubly careful for a time. Then habit will assert itself, if we have done nothing to create suspicion, and their watchfulness will relax to the point of ordinary careful observation. Toward the end of their watch, because of the strain of the battle and because of the unusually long period of duty, they will become careless, and their vigilance will be considerably below normal. But the exact time of all these things depends entirely upon their conception of time, concerning which we have no information whatever. Though it is purely a speculation, based upon Earthly and Osnomian experience, I should say that after twelve or thirteen hours would come the time for us to make the attack."

"That's good enough for me. Fine, Mart, and thanks. You've probably saved the lives of the party. We will now sleep for eleven or twelve hours."

"Sleep, Dick! How could you?" Dorothy exclaimed.

CHAPTER V

First Blood

THE next twelve hours dragged with terrible slowness. Sleep was impossible and eating was difficult, even though all knew that they would have need of the full measure of their strength. Seaton set up various combinations of switching devices connected to electrical timers, and spent hours trying, with all his marvelous quickness of muscular control, to cut shorter and ever shorter the time between the opening and the closing of the switch. At last he arranged a powerful electro-magnetic device so that one impulse would both open and close the switch, with an open period of one one-thousandth of a second. Only then was he satisfied.

"A thousandth is enough to give us a look around, due to persistence of vision; and it is short enough so that they won't see it unless they have a recording observer on us. Even if they still have rays on us, they can't possibly neutralize our screens in that short an exposure. All right, gang? We'll take five visiplates and cover the sphere. If any of you get a glimpse of him, mark the exact spot and outline on the glass. All set?"

He pressed the button. The stars flashed in the black void for an instant, then were again shut out.

"Here he is, Dick!" shrieked Margaret. "Right here—he covered almost half the visiplate!"

She outlined for him, as nearly as she could, the exact position of the object she had seen, and he calculated rapidly.

"Fine business!" he exulted. "He's within half a mile of us, three-quarters on—perfect! I thought he'd be so far away that I'd have to take photographs to locate him. He hasn't a single ray on us, either. That bird's goose is cooked right now, folks, unless every man on watch has his hand right on the controls of a generator and can get into action in less than a tenth of a second! Hang on, gang, I'm going to step on the gas!"

After making sure that everyone was fastened immovably in their seats he strapped himself in the pilot's seat, then set the bar toward the strange vessel and applied fully one-third of its full power. The *Skylark*, of course, did not move. Then, with bewildering rapidity, he went into action; face glued to the visiplate, hands moving faster than the eye could follow—the left closing and opening the switch controlling the zone of force, the right swinging the steering controls to all points of the sphere. The mighty vessel staggered this way and that, jerking and straining terribly as the zone was thrown on and off, lurching sickeningly about the central bearing as the gigantic power of the driving bar was exerted, now in one direction, now in another. After a second or two of this mad gyration, Seaton shut off the power. He then released the zone, after assuring himself that both inner and outer screens were operating at the highest possible rating.

"There, that'll hold 'em for a while, I guess. This battle was even shorter than the other one—and a lot more decisive. Let's turn on the flood-lights and see what the pieces look like."

The lights revealed that the zone of force had indeed sliced the enemy vessel into pieces. No fragment was large enough to be navigable or dangerous and each was sharply cut, as though sheared from its neighbor by some gigantic curved blade. Dorothy sobbed with relief in Seaton's arms as Crane, with one arm around his wife, grasped his hand.

"That was flawless, Dick. As an exhibition of perfect co-ordination and instantaneous timing under extreme physical difficulties, I have never seen its equal."

"You certainly saved all our lives," Margaret added.

"Only fifty-fifty, Peg," Seaton protested, and blushed vividly. "Mart did most of it, you know. I'd have gummed up everything back there if he had let me. Let's see what we can find out about them."

He touched the lever and the *Skylark* moved slowly toward the wreckage, the scattered fragments of which were beginning to move toward and around each other because of their mutual gravitational forces. Snapping on a searchlight, he swung its beam around, and as it settled upon one of the larger sections he saw a group of hooded figures; some of them upon the metal, others floating slowly toward it through space.

"Poor devils—they didn't have a chance," he remarked regretfully. "However, it was either they or we—look out! Sweet spirits of niter!"

He leaped back to the controls and the others were hurled bodily to the floor as he applied the power—for at a signal each of the hooded figures had leveled a tube and once more the outer screen had flamed into incandescence.

As the *Skylark* leaped away, Seaton focussed an attractor

upon the one who had apparently signaled the attack. Rolling the vessel over in a short loop, so that the captive was hurled off into space upon the other side, he snatched the tube from the figure's grasp with one auxiliary attractor, and anchored head and limbs with others, so that the prisoner could scarcely move a muscle. Then, while Crane and the women scrambled up off the floor and hurried to the visiplates, Seaton cut in rays six, two-seven, and five-eight. Ray six, "the softener," was a band of frequencies extending from violet far up into the ultra-violet. When driven with sufficient power, this ray destroyed eyesight and nervous tissue, and its power increased still further, actually loosened the molecular structure of matter. Ray two-seven was operated in a range of frequencies far below the visible red. It was pure heat—under its action matter became hotter and hotter as long as it was applied, the upper limit being only the theoretical maximum of temperature. Ray five-eight was high-tension, high-frequency alternating current. Any conductor in its path behaved precisely as it would in the Ajax-Northrup induction furnace, which can boil platinum in ten seconds! These three rays composed the beam which Seaton directed upon the mass of metal from which the enemy had elected to continue the battle—and behind each ray, instead of the small energy at the command of its Osnomian inventor, were the untold millions of kilowatts developed by a one-hundred-pound bar of disintegrating copper!

THERE ensued a brief but appalling demonstration of the terrible effectiveness of those Osnomian weapons against anything not protected by ultra-powered ray screens. Metal and men—if men they were—literally vanished. One moment they were outlined starkly in the beam; there was a moment of searing, coruscating, blinding light—the next moment the beam bored on into the void, unimpeded. Nothing was visible save an occasional tiny flash, as some condensed or solidified droplet of the volatilized metal re-entered the path of that ravening beam.

"We'll see if there's any more of them loose," Seaton remarked, as he shut off the force and probed into the wreckage with a searchlight.

No sign of life or of activity was revealed, and the light was turned upon the captive. He was held motionless in the invisible grip of the attractors, at the point where the force of those peculiar magnets was exactly balanced by the outward thrust of the repellers. By manipulating the attractor holding it, Seaton brought the strange tubular weapon into the control-room through a small air-lock in the wall and examined it curiously, but did not touch it.

"I never heard of a hand-ray before, so I guess I won't play with it much until after I learn something about it."

"So you have taken a captive?" asked Margaret. "What are you going to do with him?"

"I'm going to drag him in here and read his mind. He's one of the officers of that ship, I believe, and I'm going to find out how to build one exactly like it. This old can is now as obsolete as a 1920 flivver, and I'm going to make us a later model. How about it, Mart, don't we want something really up-to-date if we're going to keep on space-hopping?"

"We certainly do. Those denizens seem to be particularly venomous, and we will not be safe unless we have the most powerful and most efficient space-ship possible. However, that fellow may be dangerous, even now—in fact, it is practically certain that he is."

"You chirped it, ace. I'd much rather touch a pound of dry nitrogen iodide. I've got him spread-eagled so that he can't destroy his brain until after we've read it, though, so there's no particular hurry about him. We'll leave him out there for a while, to waste his sweetness on the desert air. Let's all look around for the *Kondal.* I sure hope they didn't get her in that fracas."

They diffused the rays of eight giant searchlights into a vertical fan, and with it swept slowly through almost a semi-circle before anything was seen. Then there was revealed a cluster of cylindrical objects amid a mass of wreckage, which Crane recognized at once.

"The *Kondal* is gone, Dick. There is what is left of her, and most of her cargo of salt, in jute bags."

As he spoke, a series of green flashes played upon the bags, and Seaton yelled in relief.

"They got the ship all right, but Dunark and Sitar got away—they're still with their salt!"

The *Skylark* moved over to the wreck and Seaton, relinquishing the controls to Crane, donned a vacuum suit, entered the main air-lock and snapped on the motor which sealed off the lock, pumped the air into a pressure-tank, and opened the outside door. He threw a light line to the two figures and pushed himself lightly toward them. He then talked briefly to Dunark in the hand-language, and handed the end of the line to Sitar, who held it while the two men explored the fragments of the strange vessel, gathering up various things of interest as they came upon them.

Back in the control-room, Dunark and Sitar let their pressure decrease gradually to that of the terrestrial vessel and removed the face-plates from their helmets.

"Again, oh Karfedo of Earth, we thank you for our lives," Dunark began, gasping for breath, when Seaton leaped to the air-gauge with a quick apology.

"Never thought of the effect our atmospheric pressure would have on you two. We can stand yours all right, but you'd pretty nearly pass out on ours. There, that'll suit you better. Didn't you throw out your zone of force?"

"Yes, as soon as I saw that our screens were not going to hold." The Osnomians' labored breathing became normal as the air-pressure increased to a value only a little below that of the dense atmosphere of their native planet. "I then increased the power of the screens to the extreme limit and opened the zone for a moment to see how the screens would hold with the added power. That instant was enough. In that period a concentrated beam, such as I had no idea could ever be generated, went through the outer and inner screens as though they were not there, through the four-foot arenak of the hull, through the entire central installation, and through the hull on the other side. Sitar and I were wearing suits. . . ."

"Say, Mart, that's one bet we overlooked. It's a good idea, too—those strangers wore them all the time as regular equipment, apparently. Next time we get into a jam, be sure we do it; they might come in handy. Excuse me, Dunark—go ahead."

"We had suits on, so as soon as the ray was shut off, which was almost instantly, I phoned the crew to jump, and we leaped out through the hole in the hull. The air rushing out gave us an impetus that carried us many

miles out into space, and it required many hours for the slight attraction of the mass here to draw us back to it. We just got back a few minutes ago. That air-blast is probably what saved us, as they destroyed our vessel with atomic bombs and hunted down the four men of our crew, who stayed comparatively close to the scene. They rayed you for about an hour with the most stupendous beams imaginable—no such generators have ever been considered possible of construction—but couldn't make any impression upon you. Then they shut off their power and stood by, waiting. I wasn't looking at you when you released your zone. One moment it was there, and the next, the stranger had been cut in pieces. The rest you know."

"We're sure glad you two got away, Dunark. Well, Mart, what say we drag that guy in and give him the once-over?"

SEATON swung the attractors holding the prisoner until they were in line with the main air-lock, then reduced the power of the repellers. As he approached the lock various controls were actuated, and soon the stranger stood in the control room, held immovable against one wall, while Crane, with a 0.50-caliber elephant gun, stood against the other.

"Perhaps you girls should go somewhere else," suggested Crane.

"Not on your life!" protested Dorothy, who, eyes wide and flushed with excitement, stood near a door, with a heavy automatic pistol in her hand. "I wouldn't miss this for a farm!"

"Got him solid," declared Seaton, after a careful inspection of the various attractors and repellers he had bearing upon the prisoner. "Now let's get him out of that suit. No—better read his air first, temperature and pressure—might analyze it, too."

Nothing could be seen of the person of the stranger, since he was encased in vacuum armor, but it was plainly evident that he was very short and immensely broad and thick. By means of hollow needles forced through the leather-like material of the suit Seaton drew off a sample of the atmosphere within, into an Orsat apparatus, while Crane made pressure and temperature readings.

"Temperature, one hundred ten degrees. Pressure, twenty-eight pounds—about the same as ours is, now that we have stepped it up to keep the Osnomians from suffering."

Seaton soon reported that the atmosphere was quite similar to that of the *Skylark*, except that it was much higher in carbon dioxide and carried an extremely high percentage of water vapor. He took up a pair of heavy shears and laid the suit open full length, on both sides, knowing that the powerful attractors would hold the stranger immovable. He then wrenched off the helmet and cast the whole suit aside, revealing the enemy officer, clad in a tunic of scarlet silk.

He was less than five feet tall. His legs were merely blocks, fully as great in diameter as they were in length, supporting a torso of Herculean dimensions. His arms were as large as a strong man's thigh and hung almost to the floor. His astounding shoulders, fully a yard across, merged into and supported an enormous head. The being possessed recognizable nose, ears, and mouth; and the great domed forehead and huge cranium bespoke an immense and a highly developed brain.

But it was the eyes of this strange creature that fixed and held the attention. Large they were, and black—the dull, opaque, lusterless black of platinum sponge. The pupils were a brighter black, and in them flamed ruby lights: pitiless, mocking, cold. Plainly to be read in those sinister depths were the untold wisdom of unthinkable age, sheer ruthlessness, mighty power, and ferocity unrelieved. His baleful gaze swept from one member of the party to another, and to meet the glare of those eyes was to receive a tangible physical blow—it was actually ponderable force; that of embodied hardness and of ruthlessness incarnate, generated in that merciless brain and hurled forth through those flame-shot, Stygian orbs.

"If you don't need us for anything, Dick, I think Peggy and I will go upstairs," Dorothy broke the long silence.

"Good idea, Dot. This isn't going to be pretty to watch—or to do, either, for that matter."

"If I stay here another minute I'll see that thing as long as I live; and I might be very ill. Goodbye," and, heartless and bloodthirsty Osnomian though she was, Sitar had gone to join the two Terrestrial women.

"I didn't want to say much before the girls, but I want to check a couple of ideas with you two. Don't you think it's a safe bet that this bird reported back to his headquarters?"

"I have been thinking that very thing," Crane spoke gravely, and Dunark nodded agreement. "Any race capable of developing such a vessel as this would almost certainly have developed systems of communication in proportion."

"That's the way I doped it out—and that's why I'm going to read his mind, if I have to burn out his brain to do it. We've got to know how far away from home he is, whether he has turned in any report about us, and all about it. Also, I'm going to get the plans, power, and armament of their most modern ships, if he knows them, so that your gang, Dunark, can build us one like them; because the next boat that tackles us will be warned and we won't be able to take it by surprise. We won't stand a chance in the *Skylark*. With a ship like theirs, however, we can run—or we can fight, if we have to. Any other ideas, fellows?"

AS neither Crane nor Dunark had any other suggestions to offer, Seaton brought out the mechanical educator, watching the creature's eyes narrowly. As he placed one headset over that motionless head the captive sneered in pure contempt, but when the case was opened and the array of tubes and transformers was revealed, that expression disappeared; and when he added a superpower stage by cutting in a heavy-duty transformer and a five-kilowatt transmitting tube, Seaton thought that he saw an instantaneously suppressed flicker of doubt or fear.

"That headset thing was child's play to him, but he doesn't like the looks of this other stuff at all. I don't blame him a bit—I wouldn't like to be on the receiving end of this hook-up myself. I'm going to put him on the recorder and on the visualizer," Seaton continued as he connected spools of wire and tape, lamps, and lenses in an intricate system and donned a headset. "I'd hate to have much of that brain in my own skull—afraid I'd bite myself. I'm just going to look on, and when I see anything I want, I'll grab it and put it into my own brain. I'm starting off easy, not using the big tube."

He closed several switches, lights flashed, and the wires and tapes began to feed through the magnets.

"Well, I've got his language, folks, he seemed to want me to have it. It's got a lot of stuff in it that I can't understand yet, though, so guess I'll give him some English."

He changed several connections and the captive spoke, in a profoundly deep bass voice.

"You may as well discontinue your attempt, for you will gain no information from me. That machine of yours was out of date with us thousands of years ago."

"Save your breath or talk sense," said Seaton, coldly. "I gave you English so that you can give me the information I want. You already know what it is. When you get ready to talk, say so, or throw it on the screen of your own accord. If you don't, I'll put on enough voltage to burn your brain out. Remember, I can read your dead brain as well as though it were alive, but I want your thoughts, as well as your knowledge, and I'm going to have them. If you give them voluntarily, I will tinker up a lifeboat that you can navigate back to your own world and let you go; if you resist I intend getting them anyway and you shall not leave this vessel alive. You may take your choice."

"You are childish, and that machine is impotent against my will. I could have defied it a hundred years ago, when I was barely a grown man. Know you, American, that we supermen of the Fenachrone are as far above any of the other and lesser breeds of beings who spawn in their millions in their countless myriads of races upon the numberless planets of the Universe as you are above the inert metal from which this, your ship was built. The Universe is ours, and in due course we shall take it—just as in due course I shall take this vessel. Do your worst; I shall not speak." The creature's eyes flamed, hurling a wave of hypnotic command through Seaton's eyes and deep into his brain. Seaton's very senses reeled for an instant under the impact of that awful mental force; but after a short, intensely bitter struggle he threw off the spell.

"That was close, fellow, but you didn't quite ring the bell," he said grimly, staring directly into those unholy eyes. "I may rate pretty low mentally, but I can't be hypnotized into turning you loose. Also I can give you cards and spades in certain other lines which I am about to demonstrate. Being supermen didn't keep the rest of your men from going out in my ray, and being a superman isn't going to save your brain. I am not depending upon my intellectual or mental force—I've got an ace in the hole in the shape of five thousand volts to apply to the most delicate centers of your brain. Start giving me what I want, and start quick, or I'll tear it out of you."

The giant did not answer, merely glared defiance and bitter hate.

"Take it, then!" Seaton snapped, and cut in the superpower stage and began turning dials and knobs, exploring that strange mind for the particular area in which he was most interested. He soon found it, and cut in the visualizer—the stereographic device, in parallel with Seaton's own brain recorder, which projected a three-dimensional picture into the "viewing-area" or dark space of the cabinet. Crane and Dunark, tense and silent, looked on in strained suspense as, minute after minute, the silent battle of wills raged. Upon one side was a horrible and gigantic brain, of undreamed of power; upon the other side a strong man, fighting for all that life holds dear, wielding against that monstrous and frightful brain a weapon wrought of high-tension electricity, applied with all the skill that earthly and Osnomian science could devise.

Seaton crouched over the amplifier, his jaw set and every muscle taut, his eyes leaping from one meter to another, his right hand slowly turning up the potentiometer which was driving more and ever more of the searing, torturing output of his super-power tube into that stubborn brain. The captive was standing utterly rigid, eyes closed, every sense and faculty mustered to resist that cruelly penetrant attack upon the very innermost recesses of his mind. Crane and Dunark scarcely breathed as the three-dimensional picture in the visualizer varied from a blank to the hazy outlines of a giant space-cruiser. It faded out as the unknown exerted himself to withstand that poignant inquisition, only to come back in, clearer than before, as Seaton advanced the potentiometer still farther. Finally, flesh and blood could no longer resist that lethal probe and the picture became sharp and clear. It showed the captain—for he was no less an officer than the commander of the vessel—at a great council table, seated, together with many other officers, upon very low, enormously strong metal stools. They were receiving orders from their Emperor; orders plainly understood by Crane and the Osnomian alike, for thought needs no translation.

"Gentlemen of the Navy," the ruler spoke solemnly, "Our preliminary expedition, returned some time ago, achieved its every aim, and we are now ready to begin fulfilling our destiny, the Conquest of the Universe. This Galaxy comes first. Our base of operations will be the largest planet of that group of brilliant green suns, for they can be seen from any point in the Galaxy and are almost in the exact center of it. Our astronomers," here the captain's thoughts shifted briefly to an observatory far out in space for perfect seeing, and portrayed a reflecting telescope with a mirror five miles in diameter, capable of penetrating unimaginable myriads of light-years into space, "have tabulated all the suns, planets, and satellites belonging to this Galaxy, and each of you has been given a complete chart and assigned a certain area which he is to explore. Remember, gentlemen, that this first major expedition is to be purely one of exploration; the one of conquest will set out after you have returned with complete information. You will each report by torpedo every tenth of the year. We do not anticipate any serious difficulty, as we are of course the highest type of life in the Universe; nevertheless, in the unlikely event of trouble, report it. We shall do the rest. In conclusion, I warn you again—let no people know that we exist. Make no conquests, and destroy all who by any chance may see you. Gentlemen, go with power."

The captain embarked in a small airboat and was shot to his vessel. He took his station at an immense control board and the warship shot off instantly, with unthinkable velocity, and with not the slightest physical shock.

At this point Seaton made the captain take them all over the ship. They noted its construction, its power-plant, its controls—every minute detail of structure, operation, and maintenance was taken from the captain's mind and was both recorded and visualized.

THE journey seemed to be a very long one, but finally the cluster of green suns became visible and the Fenachrone began to explore the solar systems in the

area assigned to that particular vessel. Hardly had the survey started, however, when the two globular space-cruisers were detected and located. The captain stopped the ship briefly, then attacked. They watched the attack, and saw the destruction of the *Kondal*. They looked on while the captain read the brain of one of Dunark's crew, gleaning from it all the facts concerning the two space-ships, and thought with him that the two absentees from the *Kondal* would drift back in a few hours, and would be disposed of in due course. They learned that these things were automatically impressed upon the torpedo next to issue, as was every detail of everything that happened in and around the vessel. They watched him impress a thought of his own upon the record—"the inhabitants of planet three of sun six four seven three Pilarone show unusual development and may cause trouble, as they have already brought knowledge of the metal of power and of the impenetrable shield to the Central System, which is to be our base. Recommend volatilization of this planet by vessel sent on special mission." They saw the raying of the *Skylark*. They sensed him issue commands:

"Ray it for a time; he will probably open the shield for a moment, as the other one did," then, after a time skipped over by the mind under examination, "Cease raying—no use wasting power. He must open eventually, as he runs out of power. Stand by and destroy him when he opens."

The scene shifted. The captain was asleep and was awakened by an alarm gong—only to find himself floating in a mass of wreckage. Making his way to the fragment of his vessel containing the torpedo port, he released the messenger, which flew, with ever-increasing velocity, back to the capital city of the Fenachrone, carrying with it a record of everything that had happened.

"That's what I want," thought Seaton. "Those torpedos went home, fast. I want to know how far they have to go and how long it'll take them to get there. You know what distance a parsec is, since it is purely a mathematical concept; and you must have a watch or some similar instrument with which we can translate your years into ours. I don't want to have to kill you, fellow, and if you'll give up even now I'll spare you. I'll get it anyway, you know—and you also know that a few hundred volts more will kill you."

They saw the thought received, and saw its answer:

"You shall learn no more. This is the most important of all, and I shall hold it to disintegration and beyond."

Seaton advanced the potentiometer still farther, and the brain picture waxed and waned, strengthened and faded. Finally, however, it was revealed by flashes that the torpedo had about a hundred and fifty-five thousand parsecs to go and that it would take two-tenths of a year to make the journey; that the warships which would come in answer to the message were as fast as the torpedo; that he did indeed have in his suit a watch—a device of seven dials, each turning ten times as fast as its successor; and that one turn of the slowest dial measured one year of his time. Seaton instantly threw off his headset and opened the power switch.

"Grab a stopwatch quick, Mart!" he called, as he leaped to the discarded vacuum suit and searched out the peculiar timepiece. They noted the exact time consumed by one complete revolution of one of the dials, and calculated rapidly.

"Better than I thought!" exclaimed Seaton. "That makes his year about four hundred ten of our days. That gives us eighty-two days before the torpedo gets there—longer than I'd dared hope. We've got to fight, too, not run. They figure on getting the *Skylark*, then volatilizing our world. Well, we can take time enough to grab off an absolutely complete record of this guy's brain. We'll need it for what's coming, and I'm going to get it, if I have to kill him to do it."

He resumed his place at the educator, turned on the power, and a shadow passed over his face.

"Poor devil, he's conked out—couldn't stand the gaff," he remarked, half-regretfully. "However, that makes it easy to get what we want, and we'd have had to kill him anyway, I guess—Bad as it is, I'd hate to bump him off in cold blood."

He threaded new spools into the machine, and for three hours, mile after mile of tape sped between the magnets as Seaton explored every recess of that monstrous, yet stupendous brain.

"Well, that's that," he declared finally, as, the last bit of information gleaned and recorded upon the flying tape, he removed the body of the Fenachrone captain into space and rayed it out of existence. "Now what to do?"

"How can we get this salt to Osnome?" asked Dunark, whose thoughts were never far from that store of the precious chemical. "You are already crowded, and Sitar and I will crowd you still more. You have no room for additional cargo, and yet much valuable time would be lost in going to Osnome for another vessel."

"Yes, and we've got to get a lot of 'X', too. Guess we'll have to take time to get another vessel. I'd like to drag in the pieces of that ship, too—his instruments and a lot of the parts could be used."

"Why not do it all at once?" suggested Crane. "We can start that whole mass toward Osnome by drawing it behind us until such a velocity has been attained that it will reach there at the desired time. We could then go to 'X,' and overtake this material near the green system."

"Right you are, ace—that's a sound idea. But say, Dunark, it wouldn't be good technique for you to eat our food for any length of time. While we're figuring this out you'd better hop over there and bring over enough to last you two until we get you home. Give it to Shiro—after a couple of lessons, you'll find he'll be as good as any of your cooks."

FASTER and faster the *Skylark* flew, pulling behind her the mass of wreckage, held by every available attractor. When the calculated velocity had been attained, the attractors were shut off and the vessel darted away toward that planet, still in the Carboniferous Age, which possessed at least one solid ledge of metallic "X," the rarest of all earthly metals. As the automatic controls held the cruiser upon her course, the six wanderers sat long in discussion as to what should be done, what could be done, to avert the threatened destruction of all the civilization of the Galaxy except the monstrous and unspeakable culture of the Fenachrone. Nearing their destination, Seaton rose to his feet.

"Well, folks, it's like this. We've got our backs to the wall. Dunark has troubles of his own—if the Third Planet doesn't get him the Fenachrone will, and the Third Planet is the more pressing danger. That lets him out. We've got nearly six months before the Fenachrone can get back here. . . ."

"But how can they possibly find us here, or wherever we'll be by that time, Dick?" asked Dorothy. "The battle was a long way from here."

"With that much start they probably couldn't find us," Seaton replied soberly. "It's the world I'm thinking about. They've got to be stopped, and stopped cold—and we've got only six months to do it in. . . . Osnome's got the best tools and the fastest workmen I know of. . . ." his voice died away in thought.

"That sort of thing is in your department, Dick."

Crane was calm and judicial as always. "I will, of course, do anything I can, but you probably have a plan of campaign already laid out?"

"After a fashion. We've got to find out how to work through this zone of force or we're sunk without a trace. Even with rays, screens, and ships equal to theirs, we couldn't keep them from sending a vessel to destroy the earth; and they'd probably get us too, eventually. They've got a lot of stuff we don't know about, of course, since I took only one man's mind. While he was a very able man, he didn't know all that all the rest of them do, any more than any one man has all the earthly science known. Absolutely our only chance is to control that zone—it's the only thing they haven't got. Of course, it may be impossible, but I won't believe that, until I've exhausted a lot of possibilities. Dunark, can you spare a crew to build us a duplicate of that Fenachrone ship, besides those you are going to build for yourself?"

"Certainly. I will be only too glad to do so."

"Well, then, while Dunark is doing that, I suggest that we go to this Third Planet, abduct a few of their leading scientists, and read their minds. Then do the same, visiting every other highly advanced planet we can locate. There is a good chance that, by combining the best points of the warfares of many worlds, we can evolve something that will enable us to turn back these invaders."

"Why not send a copper torpedo to destroy their entire planet?" suggested Dunark.

"Wouldn't work. Their detecting screens would locate it a thousand million miles off in space, and they would ray it. With a zone of force that would get through their screens, that would be the first thing I'd do. You see, every thought comes back to that zone. We've got to get through it some way."

The course alarm sounded, and they saw that a planet lay directly in their path. It was "X," and enough negative acceleration was applied to make an easy landing possible.

"Isn't it going to be a long, slow job, chopping off two tons of that metal and fighting away those terrible animals besides?" asked Margaret.

"It'll take about a millionth of a second, Peg. I'm going to bite it off with the zone, just as I took that bite out of our field. The rotation of the planet will throw us away from the surface, then we'll release the zone and drag our prey off with us. See?"

The *Skylark* descended rapidly toward that well-remembered ledge of metal to which the object compass had led them.

"This is exactly where we landed before," Margaret commented in surprise, and Dorothy added:

"Yes, and there's that horrible tree that ate the dinosaur or whatever it was. I thought you blew it up for me, Dick?"

"I did, Dottie—blew it into atoms. Must be a good location for carnivorous trees—and they must grow awfully fast, too. As to its being the same place, Peg—sure it is. That's what object compasses are for."

Everything appeared as it had been at the time of their first visit. The rank Carboniferous vegetation, intensely, vividly green, was motionless in the still, hot, heavy air; the living nightmares inhabiting that primitive world were lying in the cooler depths of the jungle, sheltered from the torrid rays of that strange and fervent sun.

"How about it, Dot? Want to see some of your little friends again? If you do, I'll give them a shot and bring them out."

"Heavens, no! I saw them once—if I never see them again, that will be twenty minutes too soon!"

"All right—we'll grab us a piece of this ledge and beat it."

Seaton lowered the vessel to the ledge, focussed the main anchoring attractor upon it, and threw on the zone of force. Almost immediately he released the zone, pointed the bar parallel to the compass bearing upon Osnome, and slowly applied the power.

"How much did you take, anyway?" asked Dunark in amazement. "It looks bigger than the *Skylark!*"

"It is; considerably bigger. Thought we might as well take enough while we're here, so I set the zone for a seventy-five-foot radius. It's probably of the order of magnitude of half a million tons, since the stuff weighs more than half a ton to the cubic foot. However, we can handle it as easily as we could a smaller bite, and that much mass will help us hold that other stuff together when we catch up with it."

THE voyage to Osnome was uneventful. They overtook the wreckage, true to schedule, as they were approaching the green system, and attached it to the mass of metal behind them by means of attractors.

"Where'll we land this junk, Dunark?" asked Seaton, as Osnome grew large beneath them. We'll hold this lump of metal and the fragment of the ship carrying the salt; and we'll be able to hold some of the most important of the other stuff. But a lot of it is bound to get away from us—and the Lord help anybody who's under it when it comes down! You might yell for help—and say, you might ask somebody to have that astronomical data ready for us as soon as we land."

"The parade ground will be empty now, so we will land there," Dunark replied. "We should be able to land everything in a field of that size, I should think." He touched the sender at his belt, and in the general code notified the city of their arrival and warned everyone to keep away from the parade ground. He then sent several messages in the official code, concluding by asking that one or two space-ships come out and help lower the burden to the ground. As the peculiar, pulsating chatter of the Osnomian telegraph died out, Seaton called for help.

"Come here, you two, and grab some of these attractors. I need about twelve hands to keep this plunder in the straight and narrow path."

The course had been carefully laid, with allowance for the various velocities and forces involved, to follow the easiest path to the Kondalian parade ground. The hemisphere of "X" and the fragment of the *Kondal* which bore the salt were held immovably in place by the main attractor and one auxiliary; and many other auxiliaries held sections of the Fenachrone vessel. However,

the resistance of the air seriously affected the trajectory of many of the irregularly shaped smaller masses of metal, and all three men were kept busy flicking attractors right and left; capturing those strays which threatened to veer off into the streets or upon the buildings of the Kondalian capital city, and shifting from one piece to another so that none should fall freely. Two sister-ships of the *Kondal* appeared as if by magic in answer to Dunark's call, and their attractors aided greatly in handling the unruly collection of wreckage. A few of the smaller sections and a shower of debris fell clear, however, in spite of all efforts, and their approach was heralded by a meteoric display unprecedented in that world of continuous daylight.

As the three vessels with their cumbersome convoy dropped down into the lower atmosphere, the guns of the city roared a welcome; banners and pennons waved; the air became riotous with color from hundreds of projectors and odorous with a bewildering variety of scents; while all around them played numberless aircraft of all descriptions and sizes. The space below them was carefully avoided, but on all sides and above them the air was so full that it seemed marvelous that no collision occurred. Tiny one-man helicopters, little more than single chairs flying about; beautiful pleasure-planes, soaring and wheeling; immense multiplane liners and giant helicopter freighters—everything in the air found occasion to fly as near as possible to the *Skylark* in order to dip their flags in salute to Dunark, their Kofedix, and to Seaton, the wearer of the seven disks—their revered Overlord.

Finally the freight was landed without serious mishap and the *Skylark* leaped to the landing dock upon the palace roof, where the royal family and many nobles were waiting, in full panoply of glittering harness. Dunark and Sitar disembarked and the four others stepped out and stood at attention as Seaton addressed Roban, the Karfedix.

"Sir, we greet you, but we cannot stop, even for a moment. You know that only the most urgent necessity would make us forego the pleasure of a brief rest beneath your roof—the Kofedix will presently give you the measure of that dire need. We shall endeavor to return soon. Greetings, and, for a time, farewell."

"Overlord, we greet you, and trust that soon we may entertain you and profit from your companionship. For what you have done, we thank you. May the great First Cause smile upon you until your return. Farewell."

CHAPTER VI

The Peace Conference

"HERE'S a chart of the green system, Mart, with all the motions and the rest of the dope that they've been able to get. How'd it be for you to navigate us over to the third planet of the fourteenth sun?"

"While you build a Fenachrone super-generator?"

"Right, the first time. Your deducer is hitting on all eight, as usual. That big ray is hot stuff, and their ray-screen is something to write home about, too."

"How can their rays be any hotter than ours, Dick?" Dorothy asked curiously. "I thought you said we had the very last word in rays."

"I thought we had, but those birds we met back there spoke a couple of later words. Their rays work on an entirely different system than the one we use. They generate an extremely short carrier wave, like the Millikan cosmic ray, by recombining some of the electrons and protons of their disintegrating metal, and upon this wave they impose a pure heat frequency of terrific power. The Millikan rays will penetrate anything except a special ray screen or a zone of force, and carry with them—somewhat as radio frequencies carry sound frequencies—the heat rays, which volatilize anything they touch. Their ray screens are a lot better than ours, too—they generate the entire spectrum. It's a sweet system, and when we revamp ours so as to be just like it, we'll be able to talk turkey to those folks on the third planet."

"How long will it take you to build it?" asked Crane, who, dexterously turning the pages of "Vega's Handbuch" was calculating their course.

"A day or so—maybe less. I've got all the stuff, and with my Osnomian tools it won't take long. If you find you'll get there before I get done, you'll have to loaf a while—kill a little time."

"Are you going to connect the power plant to operate on the entire vessel and all its contents?"

"No—can't do it without redesigning the whole thing, and that's hardly worth while for the short time we'll use this old bus."

Building those generators would have been a long and difficult task for a corps of earthly mechanics and electricians, but to Seaton it was merely a job. The "shop" had been enlarged and had been filled to capacity with Osnomian machinery; machine tools that were capable of performing automatically and with the utmost precision and speed any conceivable mechanical operation. He put a dozen of them to work, and before the vessel reached its destination, the new offensive and defensive weapons had been installed and thoroughly tested. He had added a third screen-generator, so that now, in addition to the four-foot hull of arenak and the repellers, warding off any material projectile, the *Skylark* was also protected by an outer, an intermediate, and an inner ray-screen; each driven by the super-power of a four-hundred-pound bar and each covering the entire spectrum—capable of neutralizing any dangerous frequency known to those master-scientists, the Fenachrone.

As the *Skylark* approached the planet, Seaton swung number six visiplate upon it, and directed their flight toward a great army base. Darting down upon it, he snatched an officer into the airlock, closed the door, and leaped back into space. He brought the captive into the control room pinioned by auxiliary attractors, and relieved him of his weapons. He then rapidly read his mind, encountering no noticeable resistance, released the attractors, and addressed him in his own language.

"Please be seated, lieutenant," Seaton said courteously, motioning him to one of the seats. "We come in peace. Please pardon my discourtesy in handling you, but it was necessary in order to learn your language and thus to get in touch with your commanding officer."

The officer, overcome with astonishment that he had not been killed instantly, sank into the seat indicated, without a reply, and Seaton went on:

"Please be kind enough to signal your commanding officer that we are coming down at once, for a peace conference. By the way, I can read your signals, and will send them myself if necessary."

The stranger worked an instrument attached to his

harness briefly, and the *Skylark* descended slowly toward the fortress.

"I know, of course, that your vessels will attack," Seaton remarked, as he noted a crafty gleam in the eyes of the officer. "I intend to let them use all their power for a time, to prove to them the impotence of their weapons. After that, I shall tell you what to say to them."

"Do you think this is altogether safe, Dick?" asked Crane as they saw a fleet of gigantic airships soaring upward to meet them.

"Nothing sure but death and taxes," returned Seaton cheerfully, "but don't forget that we've got Fenachrone armament now, instead of Osnomian. I'm betting that they can't begin to drive their rays through even our outer screen. And even if our outer screen should begin to go into the violet—I don't think it will even go cherry-red—out goes our zone of force and we automatically go up where no possible airship can reach. Since their only space-ships are rocket driven, and of practically no maneuverability, they stand a big chance of getting to us. Anyway, we must get in touch with them, to find out if they know anything we don't, and this is the only way I know of to do it. Besides, I want to head Dunark off from wrecking this world. They're exactly the same kind of folks he is, you notice, and I don't like civil war. Any suggestions? Keep an eye on that bird, then, Mart, and we'll go down."

THE *Skylark* dropped down into the midst of the fleet, which instantly turned against her the full force of their giant guns and their immense ray batteries. Seaton held the *Skylark* motionless, staring into his visiplate, his right hand grasping the zone-switch.

"The outer screen isn't even getting warm!" he exulted after a moment. The repellers were hurling the shells back long before they reached even the outer screen, and they were exploding harmlessly in the air. The full power of the ray-generators, too, which had been so destructive to the Osnomian defenses, were only sufficient to bring the outer screen to a dull red glow. After fifteen minutes of passive acceptance of all the airships could do, Seaton spoke to the captive.

"Sir, please signal the commanding officer of vessel seven-two-four that I am going to cut it in two in the middle. Have him remove all men in that part of the ship to the ends, and have parachutes in readiness, as I do not wish to cause any loss of life."

The signal was sent, and, as the officer was already daunted by the fact that their utmost efforts could not even make the strangers' screens radiate, it was obeyed. Seaton then threw on the frightful power of the Fenachrone super-generators. The defensive screens of the doomed warship flashed once—a sparkling, corruscating display of incandescent brilliance—and in the same instant went down. Simultaneously the entire midsection of the vessel exploded into light and disappeared; completely volatilized.

"Sir, please signal the entire fleet to cease action, and to follow me down. If they do not do so, I will destroy the rest of them."

The *Skylark* dropped to the ground, followed by the fleet of warships, who settled in a ring about her—inactive, but ready.

"Will you please loan me your sending instrument, sir?" Seaton asked. "From this point on I can carry on negotiations better direct than through you."

The lieutenant found his voice as he surrendered the instrument.

"Sir, are you the Overlord of Osnome, of whom we have heard? We had supposed that one was a mythical character, but you must be he—no one else would spare lives that he could take, and the Overlord is the only being reputed to have a skin the color of yours."

"Yes, lieutenant, I am the Overlord—and I have decided to become the Overlord of the entire green system, as well as of Osnome."

He then sent out a call to the commander-in-chief of all the armies of the planet, informing him that he was coming to visit him at once, and the *Skylark* tore through the air to the capital city. No sooner had the earthly vessel alighted upon the palace grounds than she was surrounded by a ring of warships who, however, made no offensive move. Seaton again used the telegraph.

"Commander-in-Chief of the armed forces of the planet Urvania; greetings from the Overlord of this solar system. I invite you to come into my vessel, unarmed and alone, for a conference. I come in peace and, peace or war as you decide, no harm shall come to you, until after you have returned to your own command. Think well before you reply."

"If I refuse?"

"I shall destroy one of the vessels surrounding me, and shall continue to destroy them, one every ten seconds, until you agree to come. If you still do not agree, I shall destroy all the armed forces upon this planet, then destroy all your people who are at present upon Osnome. I wish to avoid bloodshed and destruction, but I can and I will do as I have said."

"I will come."

The general came out upon the field unarmed, escorted by a company of soldiers. A hundred feet from the vessel he halted the guards and came on alone, erect and soldierly. Seaton met him at the door and invited him to be seated.

"What can you have to say to me?" the general demanded, disregarding the invitation.

"Many things. First, let me say that you are not only a brave man; you are a wise general—your visit to me proves it."

"It is a sign of weakness, but I believed when I heard those reports, and still believe, that a refusal would have resulted in a heavy loss of our men," was the General's reply.

"It would have," said Seaton. "I repeat that your act was not weakness, but wisdom. The second thing I have to say is that I had not planned on taking any active part in the management of things, either upon Osnome or upon this planet, until I learned of a catastrophe that is threatening all the civilization in this Galaxy—thus threatening my own distant world as well as those of this solar system. Third, only by superior force can I make either your race or the Osnomians listen to reason sufficiently to unite against a common foe. You have been reared in unreasoning hatred for so many generations that your minds are warped. For that reason I have assumed control of this entire system, and shall give you your choice between co-operating with us or being rendered incapable of molesting us while our attention is occupied by this threatened invasion."

"We will have no traffic with the enemy whatever," said the general. "This is final."

"You just think so. Here is a mathematical statement

of what is going to happen to your world, unless I intervene." He handed the general a drawing of Dunark's plan and described it in detail. "That is the answer of the Osnomians to your invasion of their planet. I do not want this world destroyed, but if you refuse to make common cause with us against a common foe, it may be necessary. Have you forces at your command sufficient to frustrate this plan?"

"No; but I cannot really believe that such a deflection of celestial bodies is possible. Possible or not, you realize that I could not yield to empty threats."

"Of course not," said Seaton, "but you were wise enough to refuse to sacrifice a few ships and men in a useless struggle against my overwhelming armament, therefore you are certainly wise enough to refuse to sacrifice your entire race. However, before you come to any definite conclusion, I will show you what threatens the Galaxy."

HE HANDED the other a headset and ran through the section of the record showing the plans of the invaders. He then ran a few sections showing the irresistible power at the command of the Fenachrone.

"That is what awaits us all unless we combine against them."

"What are your requirements?" the general asked.

"I request immediate withdrawal of all your armed forces now upon Osnome and full co-operation with me in this coming war against the invaders. In return, I will give you the secrets I have just given the Osnomians—the power and the offensive and defensive weapons of this vessel."

"The Osnomians are now building vessels such as this one?" asked the general.

"They are building vessels a hundred times the size of this one, with the same armament."

"For myself, I would agree to your terms. However, the word of the Emperor is law."

"I understand," replied Seaton. "Would you be willing to seek an immediate audience with him? I would suggest that both you and he accompany me, and we shall hold a peace conference with the Osnomian Emperor and Commander-in-Chief upon this vessel. We shall be gone less than a day."

"I shall do so at once."

"You may accompany your general, lieutenant. Again I ask pardon for my necessary rudeness."

As the Urvanian officers hurried toward the palace, the other Terrestrials, who had been listening in from another room, entered.

"It sounded as though you convinced him, Dick; but that language is nothing like Kondalian. Why don't you teach it to us? Teach it to Shiro, too, so he can cook for, and talk to, our distinguished guests intelligently, if they're going back with us."

As he connected up the educator, Seaton explained what had happened, and concluded:

"I want to stop this civil war, keep Dunark from destroying this planet, preserve Osnome for Osnomians, and make them all co-operate with us against the Fenachrone. That's one tall order, since these folks haven't the remotest notion of anything except killing."

A company of soldiers approached, and Dorothy got up hastily.

"Stick around, folks. We can all talk to them."

"I believe that it would be better for you to be alone," Crane decided, after a moment's thought. "They are used to autocratic power, and can understand nothing but one-man control. The girls and I will keep out of it."

"That might be better, at that," and Seaton went to the door to welcome the guests. Seaton instructed them to lie flat, and put on all the acceleration they could bear. It was not long until they were back in Kondal, where Roban, the Karfedix, and Tarnana, the Karbix, accepted Seaton's invitation and entered the *Skylark*, unarmed. Back out in space, the vessel stationary, Seaton introduced the emperors and commanders-in-chief to each other—introductions which were acknowledged almost imperceptibly. He then gave each a headset, and ran the complete record of the Fenachrone brain.

"Stop!" shouted Roban, after only a moment. "Would you, the Overlord of Osnome, reveal such secrets as this to the arch-enemies of Osnome?"

"I would. I have taken over the Overlordship of the entire green system for the duration of this emergency, and I do not want two of its planets engaged in civil war."

The record finished, Seaton tried for some time to bring the four green warriors to his way of thinking, but in vain. Roban and Tarnan remained contemptuous. They would have thrown themselves upon him, but for the knowledge that no fifty unarmed men of the green race could have overcome his strength—to them supernatural. The two Urvanians were equally obdurate. This soft earth-being had given them everything; they had given him nothing and would give him nothing. Finally Seaton rose to his full height and stared at them in turn, wrath and determination blazing in his eyes.

"I have brought you four together, here in a neutral vessel in neutral space, to bring about peace between you. I have shown you the benefits to be derived from the peaceful pursuit of science, knowledge, and power, instead of continuing this utter economic waste of continual war. You all close your senses to reason. You of Osnome accuse me of being an ingrate and a traitor; you of Urvania consider me a soft-headed, sentimental weakling, who may safely be disregarded—all because I think the welfare of the numberless peoples of the Universe more important than your narrow-minded, stubborn, selfish vanity. Think what you please. If brute force is your only logic, know now that I can, and will, use brute force. Here are the seven disks," and he placed the bracelet upon Roban's knee.

"If you four leaders are short-sighted enough to place your petty enmity before the good of all civilization, I am done with you forever. I have deliberately given Urvanians precisely the same information that I have given the Osnomians—no more and no less. I have given neither of you all that I know, and I shall know much more than I do now, before the time of the conquest shall have arrived. Unless you four men, here and now, renounce this war and agree to a perpetual peace between your worlds, I shall leave you to your mutual destruction. You do not yet realize the power of the weapons I have given you. When you do realize it, you will know that mutual destruction is inevitable if you continue this internecine war. I shall continue upon other worlds my search for the one secret standing between me and a complete mastery of power. That I shall find that secret I am confident; and, having found it, I shall, without your aid, destroy the Fenachrone.

"You have several times remarked with sneers that you are not to be swayed by empty threats. What I am about to say is no empty threat—it is a most solemn

promise, given by one who has both the will and the power to fulfill his every given word. Now listen carefully to this, my final utterance. If you continue this warfare and if the victor should not be utterly destroyed in its course, I swear as I stand here, by the great First Cause, that I shall myself wipe out every trace of the surviving nation as soon as the Fenachrone shall have been obliterated. Work with each other and me and we all may live—fight on and both your nations, to the last person, will most certainly die. Decide now which it is to be. I have spoken."

ROBAN took up the bracelet and clasped it again about Seaton's arm, saying, "You are more than ever our Overlord. You are wiser than are we, and stronger. Issue your commands and they shall be obeyed."

"Why did not you say those things first, Overlord?" asked the Urvanian emperor, as he saluted and smiled. "We could not in honor submit to a weakling, no matter what the fate in store. Having convinced us of your strength, there can be no disgrace in fighting beneath your screens. An armlet of seven symbols shall be cast and ready for you when you next visit us. Roban of Osnome, you are my brother."

The two emperors saluted each other and stared eye to eye for a long moment, and Seaton knew that the perpetual peace had been signed. Then all four spoke, in unison:

"Overlord, we await your commands."

"Dunark of Osnome is already informed as to what Osnome is to do. Say to him that it will not be necessary for him to build the vessel for me; the Urvanians will do that. Urvan of Urvania, you will accompany Roban to Osnome, where you two will order instant cessation of hostilities. Osnome has many ships of this type, and upon some of them you will return your every soldier and engine of war to your own planet. As soon as possible you will build for me a vessel like that of the Fenachrone, except that it shall be ten times as large, in every dimension, and except that every instrument, control, and weapon is to be left out."

"Left out? It shall be so built—but of what use will it be?"

"The empty spaces shall be filled after I have returned from my quest. You will build this vessel of dagal. You will also instruct the Osnomian commander in the manufacture of that metal, which is so much more resistant than their arenak."

"But, Overlord, we have. . . . "

"I have just brought immense stores of the precious chemical and of the metal of power to Osnome. They will share it with you. I also advise you to build for yourselves many ships like those of the Fenachrone, with which to do battle with the invaders, in case I should fail in my quest. You will, of course, see to it that there will be a corps of your most efficient mechanics and artisans within call at all times in case I should return and have sudden need for them."

"All these things shall be done."

The conference ended, the four nobles were quickly landed upon Osnome and once more the *Skylark* traveled out into her element, the total vacuum and absolute zero of the outer void, with Crane at the controls.

"You certainly sounded savage, Dick. I almost thought you really meant it!" Dorothy chuckled.

"I did mean it, Dot. Those fellows are mighty keen on detecting bluffs. If I hadn't meant it, and if they hadn't known that I meant it, I'd never have got away with it."

"But you *couldn't* have meant it, Dick! You wouldn't have destroyed the Osnomians, surely—you know you wouldn't."

"No, but I would have destroyed what was left of the Urvanians, and all five of us knew exactly how it would have turned out and exactly what I would have done about it—that's why they all pulled in their horns."

"I don't know what would have happened," interjected Margaret. "What would have?"

"With this new stuff the Urvanians would have wiped the Osnomians out. They are an older race, and so much better in science and mechanics that the Osnomians wouldn't have stood much chance, and knew it. Incidentally, that's why I'm having them build our new ship. They'll put a lot of stuff into it that Dunark's men would miss—maybe some stuff that even the Fenachrone haven't got. However, though it might seem that the Urvanians had all the best of it, Urvan knew that I had something up my sleeve besides my bare arm—and he knew that I'd clean up what there was left of his race if they polished off the Osnomians."

"What a frightful chance you were taking, Dick?" gasped Dorothy.

"You have to be hard to handle those folks—and believe me, I was a forty-minute egg right then. They have such a peculiar mental and moral slant that we can hardly understand them at all. This idea of cooperation is so new to them that it actually dazed all four of them even to consider it."

"Do you suppose they will fight, anyway?" asked Crane.

"Absolutely not. Both nations have an inflexible code of honor, such as it is, and lying is against both codes. That's one thing I like about them—I'm sort of honest myself, and with either of these races you need nothing signed or guaranteed."

"What next, Dick?"

"Now the real trouble begins. Mart, oil up the massive old intellect. Have you found the answer to the problem?"

"What problem?" asked Dorothy. "You didn't tell us anything about a problem."

"No, I told Mart. I want the best physicist in this entire solar system—and since there are only one hundred and twenty-five planets around these seventeen suns, it should be simple to yon phenomenal brain. In fact, I expect to hear him say 'elementary, my dear Watson, elementary'!"

"Hardly that, Dick, but I have found out a few things. There are some eighty planets which are probably habitable for beings like us. Other things being equal, it seems reasonable to assume that the older the sun, the longer its planets have been habitable, and therefore the older and more intelligent the life. . . . "

"'Ha! ha! It was elementary,' says Sherlock." Seaton interrupted. "You're heading directly at that largest, oldest, and most intelligent planet, then, I take it, where I can catch me my physicist?"

"Not directly at it, no. I am heading for the place where it will be when we reach it. That *is* elementary."

"Ouch! That got to me, Mart, right where I live. I'll be good."

"But you are getting ahead of me, Dick—it is not as simple as you have assumed from what I have said so far. The Osnomian astronomers have done wonders in the short time they have had, but their data, particularly on the planets of the outer suns, is as yet necessarily very incomplete. Since the furthermost outer sun is probably the oldest, it is the one in which we are most interested. It has seven planets, four of which are probably habitable, as far as temperature and atmosphere are concerned. However, nothing exact is yet known of their masses, motions, or places. Therefore I have laid our course to intercept the closest one to us, as nearly as I can from what meager data we have. If it should prove to be inhabited by intelligent beings, they can probably give us more exact information concerning their neighboring planets. That is the best I can do."

"That's a darn fine best, old top—narrowing down to four from a hundred and twenty-five. Well, until we get there, what to do? Let's sing us a song, to keep our fearless quartette in good voice."

"Before you do anything," said Margaret seriously, "I would like to know if you really think there is a chance of defeating those monsters."

'IN ALL seriousness, I do. In fact, I am quite confident of it. If we had two years, I know that we could lick them cold; and by stepping on the gas I believe we can get the dope in less than the six months we have to work in."

"I know that you are serious, Dick. Now you know that I do not want to discourage any one, but I can see small basis for optimism," Crane spoke slowly and thoughtfully. "I hope that you will be able to control the zone of force—but you are not studying it yourself. You seem to be certain that somewhere in this system there is a race who already knows all about it. I would like to know your reasons for thinking that such a race exists."

"They may not be upon this system; they may have been outsiders, as we are—but I have reasons for believing them to be natives of this system, since they were green. You are as familiar with Osnomian mythology as I am—you girls in particular have read Osnomian legends to Osnomian children for hours. Also identically the same legends prevail upon Urvania. I read them in that lieutenant's brain—in fact, I looked for them. You also know that every folk-legend has some basis, however tenuous, in fact. Now, Dottie, tell about the battle of the gods, when Osnome was a pup."

"The gods came down from the sky," Dorothy recited. "They were green, as were men. They wore invisible armor of polished metal, which appeared and disappeared. They stayed inside the armor and fought outside it with swords and lances of fire. Men who fought against them cut them through and through with swords, and they struck the men with lances of flame so that they were stunned. So the gods fought in days long gone and vanished in their invisible armor, and——"

"That's enough," interrupted Seaton. "The little red-haired girl has her lesson perfectly. Get it, Mart?"

"No, I cannot say that I do."

"Why, it doesn't even make sense!" exclaimed Margaret.

"All right, I'll elucidate. Listen!" and Seaton's voice grew tense with earnestness. "Visitors came down out of space. They were green. They wore zones of force, which they flashed on and off. They stayed inside the zones and projected their images outside, and used rays *through the zones.* Men who fought against the images cut them through and through with swords, but could not harm them since they were not actual substance; and the images directed rays against the men so that they were stunned. So the visitors fought in days long gone, and vanished in their zones of force. How does that sound?"

"You have the most stupendous imagination the world has ever seen—but there may be some slight basis of fact there, after all," said Crane, slowly.

"I'm convinced of it, for one reason in particular. Notice that it says specifically that the visitors *stunned* the natives. Now that thought is absolutely foreign to all Osnomian nature—when they strike they kill, and always have. Now if that myth has come down through so many generations without having that 'stunned' changed to 'killed', I'm willing to bet a few weeks of time that the rest of it came down fairly straight, too. Of course, what they had may not have been the zone of force as we know it, but it must have been a ray of some kind—and believe me, that was one educated ray. Somebody sure had something, even 'way back in those days. And if they had anything at all back there, they must know a lot by now. That's why I want to look 'em up."

"But suppose they want to kill us off at sight?" objected Dorothy. "They might be able to do it, mightn't they?"

"Sure, but they probably wouldn't want to—any more than you would step on an ant who asked you to help him move a twig. That's about how much ahead of us they probably are. Of course, we struck a pure mentality once, who came darn near dematerializing us entirely, but I'm betting that these folks haven't got that far along yet. By the way, I've got a hunch about those pure intellectuals."

"Oh, tell us about it!" laughed Margaret. "Your hunches are the world's greatest brainstorms!"

"Well, I pumped out and rejeweled the compass we put on that funny planet—as a last resort, I thought we might maybe visit them and ask that bozo we had the argument with to help us out. I think he—or it—would show us everything about the zone of force we want to know. I don't think that we'd be dematerialized, either, because the situation would give him something more to think about for another thousand cycles; and thinking seemed to be his main object in life. However, to get back to the subject, I found that even with the new power of the compass the entire planet was still out of reach. Unless they've dematerialized it, that means about ten billion light-years as an absolute minimum. Think about that for a minute! . . . I've just got a kind of a hunch that maybe they don't belong in this Galaxy at all—that they might be from some other Galaxy, planet and all; just riding around on it, as we are riding in the *Skylark.* Is the idea conceivable to a sane mind, or not?"

"Not!" decided Dorothy, promptly. "We'd better go to bed. One more such idea, in progression with the last two you've had, would certainly give you a compound fracture of the skull. 'Night, Cranes."

End of Part I.

The Mystery *of* Professor Brown

By A. L. Hodges

Author of "The Pea Vine Mystery," and "The Dead Sailor."

RECENTLY we published in AMAZING STORIES, *two very short stories by A. L. Hodges—who, we might adequately mention here, is himself a scientist of no mean ability—which were warmly received by our readers. It was an interesting novelty feature, they thought, which might well be repeated from time to time. The publication of very short short stories is in an experimental stage now, and though it is a tremendous task to write a worthwhile short tale dealing with scientifiction, not often entirely successful. We know you will enjoy reading this exceedingly interesting bit of scientific fiction in condensed form.*

PROFESSOR Yarboro Brown was a man in the prime of life—healthy, husky and strong—yet they found him sprawled out on the floor of his classroom, dead.

Dead without a mark on him.

There was no slightest mark on his body and he had certainly been living ten minutes before the discovery, for he died between the dismissal of one class and the coming of another.

The professor was one of the really big men in electrical science and his death was so mysterious that its solution challenged and received the best efforts of the city and state authorities.

The police investigated his life and found only that he had served in the war, receiving a slight scalp wound; that he had no enemies whatsoever; that he was constantly experimenting.

The coroner ordered an autopsy. The internal organs were found in excellent condition. There was no poison in the stomach. There was no evidence of heart trouble.

The body was embalmed and interred.

The mystery remained a mystery.

Yet Dr. Willie Jones, assistant to Professor Brown, decided that he was not through with the case. He determined to take it up as a research problem and solve it. He set about interviewing members of the last class instructed by the professor, and found that he had been lecturing on, and demonstrating, a new induction furnace, the new electrical furnace for metals. The one he had was an experimental one. He showed the class how he could hold his hand in this furnace without discomfort, provided there were no rings on his fingers, but that if he held a nail in the furnace it soon became red hot. Iron and that furnace, apparently, didn't agree.

Jones decided to look over this furnace. He found that it was insecurely fastened to the wall, and, looking down, saw a screw-driver that had evidently been dropped on the floor. As the furnace was going when the body was found, Jones was satisfied that it was connected in some way with the death of the professor. He therefore picked up the screw-driver and started to tighten the screw that was loose which was outside the furnace.

He found that the most convenient position for him to assume in tightening this screw placed the top of his head in the mouth of the furnace itself. And here he was more mystified than ever. This should not cause any discomfort, much less death.

So temporarily Jones gave up trying to solve the mystery of the death of Prof. Brown.

When, however, he saw the police report he thought over the matter harder than ever, and finally arrived at an astounding conclusion. He went to see the coroner, stated that he was absolutely certain that the old scalp wound suffered by the professor during the war had contained a fragment of metal, that this metal had become red hot when the Professor poked his head into the induction furnace, and had killed his chief.

After some persuasion the coroner agreed to disinter the body and take an X-ray of the head. This was done and disclosed that Jones was correct, and that the fragment of iron had burned a clean hole from just under the top of the skull down through the brain as its weight caused it to sink down into the hole which it had burned for itself.

Professor Brown had forgotten that the surgeon had told him there might still be a small fragment of iron left in his skull.

THE END

By

Peter van Dresser

(Concerning a possible future industry and some episodes of interest connected with it.)

Illustrated
by
MOREY

So these were the mighty steel monsters which hauled the produce of New Sidney to the outer world!

PECULIARLY opportune at this time is a story dealing with the antarctic Polar regions. Admiral Byrd, having established himself at the South Pole, has brought these erstwhile unknown regions considerably within the scope of our knowledge. But aside from the interest which we now have in the South Polar regions, our new author deals with another exceedingly ingenious idea revolving around the subject of beryllium. This element is a metallic base of the emerald, and bids fair to enter into industry on a large scale as a metal of valuable qualities. Mr. van Dresser knows his subject; there is no doubt about that. And what is equally important—he knows how to write about it! This is one of the best short stories of scientific fiction which we have published thus far. We hope to get more from this author.

South Polar Beryllium, Limited

OFFICIAL plane number three of South Polar Beryllium Ltd., droned its way southward through the cold, thin air a thousand feet above the great antarctic plateau. Its four Thordarson oil turbines driving it through the rare atmosphere at an easy two hundred and ninety miles an hour roared a song of power which penetrated the insulated walls of the passenger cabin and murmured subdued harmonies in its warm, comfortable interior. Hunched comfortably in his wicker seat, Wallace de Vries Hamilton, assistant chemist of the great S. P. B. Ltd., looked out of his window at the jagged white desolation below and shivered. It was a country hostile to mankind—a country of vast snow deserts seamed by treacherous crevasses, of high solitary plateaus swept by terrific windstorms, of gaunt mountain ranges whose rocky flanks jutted up through the monotonous mantle of white. During four weary months of each year it was a land of deadly cold and darkness, when the aurora australis flickered and wove eerie shifting patterns of greenish light in the chill sky.

Hamilton thought of the early antarctic explorations which preceded and made possible man's present familiarity with the south polar regions. Over a century ago—before the middle of the nineteenth century—explorers had headed their sailing craft southward, to the bottom of the world, in a serious attempt to penetrate the great ice barrier which everywhere guarded the antarctic coast line. Their ships were often crushed in the relentless grasp of the ice, or overwhelmed in terrific gales. They were forced to endure sometimes years of imprisonment and solitude before they could fight their way northward again. Yet little by little such men as Cook, Ross, D'Urville and Wilkes, added to our store of knowledge concerning at least the outer limits of these unknown regions.

But it was not until the twentieth century that inland expeditions of any length were made. Then Scott, Drygalski, Shackleton, Bruce, and others penetrated somewhat into the interior, locating the coast line of Victoria quadrant west of the Ross Sea, of Kaiser Wilhelm Second Land in the Enderby quadrant, and of Coates Land and West Antarctica, that desolate archipelago thrusting out towards Cape Horn in the Weddel Sea.

It seemed incredible that man should carry on for no tangible reward under such difficult conditions as beset these early explorers. All progress was made only by the most dogged and continuous physical effort—weary weeks and months of trekking on snow shoes or on skis. Sufficient food could be carried only by the most careful planning, and when unexpected setbacks occurred, suffering and privation inevitably followed. And always there was the bitter cold waiting to cripple by frostbite or kill outright.

The climax of this era of exploration was reached when Amundsen, in a carefully planned and perfectly executed expedition reached the pole on December sixteenth 1911, and returned safely. Almost a month later Scott attained the same goal, only to meet bitter disappointment in the discovery of Amundsen's cairn, and grim death on the return trail.

It was not until the nineteen-twenties that man had sufficiently perfected his new tools, the radio and the airplane, to enable him to employ them successfully in remote parts of the world. Hamilton remembered the names of Byrd, the careful organizer and scientific explorer, and Wilkins, the brilliant free lance, as pioneers of aeronautical polar expeditions. Since that time, with the improvement of equipment, antarctic exploration had been carried farther and farther till by nineteen-forty the whole continent was fairly well mapped.

For ten years then interest had been dormant. During the period of exploration, the continent had been parcelled tentatively out among several nations, notably England, the United States, Norway and Germany. Interest had been rather keen in this division, and several disputes had arisen over boundaries and conflicting claims, but as the years rolled by this interest waned, for no rich deposits of coal, mica or petroleum, as had been expected, were discovered. In 1952, by mutual consent of the interested nations, administration of the antarctic regions had been transferred to an unimportant bureau of the League of Nations. The principal questions which arose concerning these regions were those relating to maritime and aeronautical law, and hence were of international concern.

Thus Antarctica remained a desolate waste, crossed by a few dirigible lines and now and then by scientific expeditions in planes or motor sleds for the purpose of making geological, meteorological, or magnetic observations.

And then in 1957 Frobisher—Sydney Frobisher, the picturesque, reckless, hard-bitten adventurer and scientific pioneer—had come up from this forgotten bottom of the world with startling news.

In the barren uplands three hundred miles southwest of King Edward VII Land he had discovered phenomenally rich veins of aluminum and beryllium metasilicate!

Hamilton remembered the excitement that prevailed when the information leaked out. Twenty-two years earlier the refinement of beryllium ores had become commercially practicable, and alloys of the metal were rapidly introduced into airplane and airship construction. Fairly large deposits near Nerchinsk, in Siberia, had proved the best source of supply hitherto, but Frobisher's discovery revealed vast possibilities. And that versatile man, as soon as he arrived in Australia, had devoted his great energy and powerful personality to organizing a company for the development of these possibilities.

Hamilton remembered well the aura of romantic adventure which had invested Frobisher's name; in this age when romance and adventure were seemingly dead and the world a well-charted and easily traversed globe. In 1955 he had set out alone from Little America in a light Alfure tractor-sled equipped with a molecular resonance ore finder and analyzer. The antarctic had swallowed him up, and the public read of another crazy prospector risking his life futilely. Hamilton could imagine him guiding his machine over terrain like that below—picking his way around dangerous crevasses, breasting furious blizzards, making his little camp at night crouched over his butylene stove. He reappeared in three months—said little, laid in provisions and disappeared again. For two years Frobisher maintained this schedule—until one day he returned to make his amazing announcement. Not to the public at first—not until South Polar Beryllium Ltd. of Melbourne was organized and had gained control of the richest of the deposits.

Hamilton, young and impressionable at the time, had been thrilled at the wonderful display of the powers of the modern engineering and economic systems. Little America, the tiny settlement and expedition base on the east shore of the Ross Sea, had rapidly grown into a thriving port with facilities for handling and trans-shipping the ore. New Sidney, a unique semi-underground city had been created at the mine head—transport problems had been met and solved with amazing ingenuity.

And by the time Hamilton graduated with honors from Colorado School of Mines, the pioneering had all been done—another ore field had been discovered, and the international metallurgical corporation of Berne had seized that for development.

NOW all this was commonplace—and Hamilton was only an unusually young assistant corporation chemist making a quick trip to the mine. Life was a trifle monotonous nowadays. If only one of the big Thordarson turbines would fail, and bring them limping into port! Or if a terrible polar blizzard would shriek out of the southwest and resist furiously every inch of their progress. But no, those oil turbines could roar at top speed for seven hundred hours and never miss a power cycle; while as for storms, the meteorological service warned of them long in advance, and they howled out their furies through empty skies.

Or what if bandits should attack the plane! After all, big interests were involved in this trip. If International Met. had somehow gotten wind of the new refining method, and had put secret agents on his trail . . . Pshaw! He was imagining an old-fashioned melodrama, with secret interests and sabotage and all the rest of it. Exciting if true—but, after all, the scenery below was mighty inhospitable, and it was pleasanter to think about adventure here than to undergo it.

A glance at his watch showed the plane an hour and a quarter out from Little America. In fifteen or twenty minutes more they were due at New Sidney. No sign of civilization yet—only the jagged, crevassed expanse of Mary Byrd Land slipped by below. He wondered how they would fare if the radio beacon down whose in-groove they were heading, should suddenly cease. Astronomical navigation in these parts was extraordinarily difficult, and the magnetic compass very unreliable.

Suddenly his attention was focussed on a tiny black dot on the snow field far below and to the right. The pilot evidently had seen it too, for the plane swerved a trifle and began a long sweeping glide. The dot grew larger and larger, grew into a beetle—a monstrous black beetle crawling over the white surface. It dawned on Hamilton that this formidable bug was one of the huge freight tractors operating between Little America and New Sidney. Now he could see the famous Arlington Tractor Route, the hard packed lane winding its way back north and west one hundred miles through tortuous Rhyker Pass in the Charles Bob Mountains. Here, in a series of hairpin loops and turns, it dropped seven thousand feet to the level of Ross Barrier, whence it turned almost north and drove towards Little America over the comparatively level surface.

They were now only a few hundred feet above the tractor; Hamilton could see and appreciate its vast bulk. Fully eighty feet long and fifteen feet high—it relentlessly clanked its way forward like some ponderous prehistoric monster. Its great driving wheels revolved majestically, carrying their caterpillar treads, whose six foot plates crunched and bit into the packed snow surface with irresistible force. The whole atmosphere in the region of this vast machine trembled with the exhaust roar of its turbines, the earth quaked under its giant's tread. Hamilton noticed the row of steel hatches down its back where the ore from the mines was loaded in, and another row along one side from which the ore poured out at the discharging station in Little America. Up at the "bow" was a small deck-house terminating in a glass enclosed control room. As the plane swooped down, a window opened and an arm reached out to wave a greeting. The pilot acknowledged it and the turbines of the airplane resumed their hum. Upward they swept in a long climb which soon reduced the great tractor to the size of an insignificant crawling ant. So these were the mighty steel monsters which hauled the produce of New Sidney to the outer world!

The atmosphere, which had so far been clear and sparkling, was becoming slightly hazy. The snow-covered land below grew rapidly indistinct in a fog through which the sun gleamed with a dull white pallor. Yet the pilot seemed not at all dismayed by the lack of visibility. His echo altimeter gave him his exact height above ground, while the radio beacon held him rigidly to the course. In fact, the automatic helmsman, with which these planes were equipped, frequently took charge for the whole trip. Hamilton noted with relief that they were now under automatic control, for with the coming of the fog the pilot had thrown in the "iron mike" and was leaning back in his seat gazing out of the window.

Suddenly a tiny green light glowed on the instrument board. The pilot opened a little window into the passenger compartment and called back to Hamilton—"We've picked up the high frequency sound beacon from the field. Our receptor is holding us right in the center

of the beam which slants down to the field at the right gliding angle."

As he spoke, the roar of the propellers died away to a purr.

"It even throttles the motors at the proper altitude—Lord! In calm weather like this the pilot might as well curl up and go to sleep after the take-off. There's nothing else he has to do."

Two parallel red glowing tracks appeared in the fog below them—the neon landing guides laid even with or a little below the surface of the flying field. The plane settled lightly between them, rolled a hundred yards and came to a stop.

The Mine

THE surface of the flying field stretched away dimly into the mist. At its edges could be seen the vague bulk of low snow-covered buildings. The pilot pointed ahead to one of them. "The hangars—we'll taxi inside and unload there—we never do anything outside here if we can help it. Too cold!"

As they approached the building, a low, wide doorway opened and the plane slid smoothly into the lighted and warmed interior. They came to rest in line with a dozen planes of similar type—light mail and passenger carriers. Hamilton climbed out of the cabin, grip in hand. The baggage compartment had already been opened, and attendants were hurling mail sacks into a little electric truck.

He stood irresolute for a moment till he spied a stocky, red-faced little man hurrying towards him.

"You're Hamilton, the new assistant chemist? I'm Pat McIntyre, general super here. Mighty glad to see you, Mr. Hamilton—I've heard a good deal about you from headquarters. Come along and I'll show you your rooms. I guess you'd like to wash up a bit."

The little man talking volubly led the way. "We haven't much above ground here—just these hangars, with official quarters and offices at the north end of them, and a few miscellaneous buildings, ventilating stacks, freight elevator outlets, and so on. There's not much advantage in outside exposure here—the view is sort of monotonous, even if it happens to be a clear day, and it's too hard to keep the buildings warm and clear of snow. Well here we are."

They had passed through several concrete floored passageways and entered a small bedroom with a window opening on the flying field.

"My room is right around the corner—in fact most of the officers live on this floor. The mess hall, lounge and so on are on the ground floor. Also the offices—what there are of them. Mine, the field metallurgist's, the transportation engineer's, the chief mining engineer's and a few others. A fancy lot of titles, but they're a good bunch. Come on down as soon as you're ready."

Hamilton examined his room. It was of concrete with a tiled floor—all fireproof construction. The outer wall, where the window embrasure pierced it, was at least two and a half feet thick, made of reinforced concrete and double thickness of hollow tile for insulation. The window itself was of triple glass permanently set in. Near the floor he noticed a small grated opening. A current of pleasantly warmed air was flowing into the room. The building seemed admirably constructed to withstand the rigors of the antarctic climate. Presently he became aware of a dull murmur and pulsation which drifted up the ventilating duct and permeated the atmosphere, like the throb of engines, which is always present on shipboard. It was the voice of the mine, the mingled vibrations of all the great machines incessantly at work in the depths below. All this was new and intensely interesting to the young chemist; he had worked so far only at the refining plant in Melbourne and had no opportunity to visit New Sidney. He anticipated with pleasure his trip through the mine with McIntyre. It would certainly be unique, like no mine he had ever seen before.

A sudden roar from outside, which penetrated the triple glass windows, attracted his attention. A great door had opened in one of the distant buildings. Nosing its way outward, like a gigantic blind mammoth, was one of the freight tractors of the sort they had passed in the plain. He watched while its skipper jockeyed it through the portal with great roaring spurts of its port or starboard turbine. At last it was outside, the door slid shut and the vast machine lumbered off westward through the mist for its three-hundred-mile trek to Little America.

McIntyre was busy looking over some reports as Hamilton entered his office. "Have a seat," he said. "There won't be time to look over the works before lunch, so I thought we could pass the hour profitably in conversation." He hitched his chair to a more comfortable angle and drew out a smoke-blackened brier pipe.

"I understand from a letter which I received yesterday from the chief that you are down here on fairly important business. Naturally I am mighty curious to hear what you have to say—though to be frank, I think I have a good idea of what you'll talk about. Tell me now—you have some plan for cutting down on the weight of our ore shipment to Little America—isn't that it?"

"Right you are," assented Hamilton, "but I don't see how you knew it. That's all supposed to be a deep secret."

"Nothing to it! If you'd been in this outfit as long as I have and gone to every blessed yearly board meeting, where old Frobisher invariably comes down like a ton of brick on Saunders (he's our transportation man here) because his bloomin' little tractors run up too big an expense account—you'd know what the old man is worrying about. I know it's the overland haul that eats into our profits. The worst of it is that seventy-five percent of the cargo is worthless—slags out in the furnaces at Melbourne.

"I know that's the problem Earl Strauber was working on. The old man put a lot of store by him—and I happen to know that he was pretty hard hit when Strauber went bad and had to be fired for misappropriation of funds. Naturally Frobisher looked for a man to continue the work and picked you, for your success with pyrargyrite ores at the Gila mines. And by the look in your eye, I'd say that maybe you've figured this thing out! Am I right?"

"That's about it!" laughed Hamilton, "you seem to be quite a Sherlock Holmes. I never knew that there was any scandal connected with Strauber's disappearance."

"Oh, sure—he was a bad egg—I never liked him—met him a couple of times when he came down to look the mine over. They do say he was a dam' good metallurgist.

Lord, you never can tell what a man will do." He fell silent puffing at his stubby pipe.

Hamilton was unbuckling the straps of his brief case. He took out a package of typed pages and blueprints and tossed it on the desk.

"McIntyre—that's a batch of papers that is going to cause you some sleepless nights during the next year or so. They are the tentative plans for the installation here of an experimental forced-field ionic separator for the reduction of beryllium and aluminium metasilicates to beryllium oxide."

The superintendent looked keenly at Hamilton. "The name of that apparatus is mighty impressive, but its strange to me. If it can do that little trick in a way that we can manage here—I begin to understand what Frobisher meant when he said you were coming here on important business."

"Exactly. There is no necessity for enlarging on the value of this method of refining. With it we can, by purely chemical and electrical apparatus, produce fairly pure beryllium oxide at the mine head. No heat or fuel is required. The apparatus uses only water as a solvent and electric current to set up certain fields of force. I'll give you a brief idea of how the thing works. It's my own brain-child and naturally I'm rather proud of it.

"Of course, the metasilicate is normally insoluble. To make use of any of the ordinary chemical operations which are not accompanied by combustion or similar violent reactions, it is necessary to have the reacting materials in solution and in an ionized state. Accordingly, I have worked on the problem of forcing solution and ionization in normally insoluble substances. Taking my cue from the known effect of ultra-violet light and the various other ionizing agents, and also working with alternating high-frequency electrostatic fields, I succeeded in developing a projector, which, in conjunction with a field of proper frequency and intensity, would first shatter the suspended crystals of the ore into their component molecules and would then break up those molecules into their component ions. (Bear with me, MacIntyre!)

"Having dissolved and ionized the compound, it is then necessary to differentiate between the ions, as it were, 'pick out' the ions which we want to combine again into new compounds, remove them from the ionizing field, and then allow them to unite. By proper placing of the electrodes, it is possible to separate the positive and negative ions, and by an application of the principle of the molecular resonance apparatus used in ore prospecting, I shield each electrode from all ions but those of a certain mass." He smiled at MacIntyre's look of patient resignation.

"What all this boils down to can be expressed in this equation." He took up a piece of paper and wrote:

$$Al_2Be_3(SiO_3)_6 + 9H_2O \rightarrowtail 3BeO\downarrow + 2Al(OH)_3\downarrow + 6H_2SiO_3$$

"In ordinary chemistry that is an impossible equation. It just wouldn't work. But by the proper application of force I can *make* it work. The products separate out at different electrodes and have no opportunity to recombine except as we choose. So we have nothing but beryllium oxide to ship—a fraction of the weight you carry at present—to say nothing of the simplification of the refining process.

"I have worked out the practical application of this method with Hardman at the Melbourne plant. We have been successfully operating one of the units for six weeks now. Hardman has also made a series of tentative plans for the installation of the apparatus here. These I have brought down.

"Obviously the new unit must be operated as part of the ore-dressing department. As it requires finely divided material for proper operation, we decided to use the discharge from your concentrating tables, which is the metasilicate pretty well purified and granulated. Of course, if the process entirely supplants the fused-ore electrolytic works at Melbourne, we'll run all the ore through the grinders and pulverizers, then through the hydraulic separators and concentrators so as to get a uniform product. And I guess that's about the whole story—except that I want you to check over these plans and routing schedules. In them I've given you all the dope about the dimensions, the hourly capacity of the machine, and the necessary hydraulic and electric connections. Everything is there but the 'insides' which we're keeping as a company secret. It's rather risky, but we hope to keep our advantage over International Met. longer than the few years of patent protection."

"Well," said MacIntyre as he rose and knocked the ashes out of his pipe, "I can see where I'm in for a stretch of hard work whipping a brand-new process into shape to meet practical conditions. Gosh! When I think of some of the sessions with dumb shop foremen—not to mention annual third degrees in front of dumber boards of directors—but it'll be worth it! Let's be getting to lunch. Afterwards I guess you'd like to take a look around." He placed the plans in a drawer of his desk and locked it.

A Subterranean Industry

THE "mess hall" was a spacious, airy room, well lit by large triple glass windows and colite tubes set in the ceiling. Hamilton enjoyed the meal; many of the men were old timers who had tales to tell of the founding of New Sidney, of the difficulties and hazards that the pioneers underwent. He heard descriptions of forced landings hundreds of miles from civilization, of lost motor-sleds wandering for days in unexplored canyons and mountain passes; grisly tales of frozen corpses and unsolved mysteries. Those must have been the days!

After lunch, MacIntyre announced that he could spare the afternoon and was ready to accompany Hamilton on a tour of inspection. "First," he said, "I think you ought to see our power plant. It's the heart of the whole establishment, of course. And it's not deep, as we built it right at the start."

They went down a concrete stairway to the first level, which was just beneath the surface. After traversing a few colite-illuminated corridors, they entered the dynamo room—long and low, with rows of squat direct-coupled Tesla turbines and alternators. The walls were paneled with switchboards and meters which fluctuated slightly with the varying loads on the innumerable mine motors. A few attendants were present; otherwise the only indications of the tremendous force generated in this room was the high pitched whine of the turbine discs spinning at terrific speed.

"These are operating at fifteen hundred pounds pressure and I forgot what temperature," MacIntyre in-

formed Hamilton, "but it's so high that the blades have to be made of aranium. We have to give credit to you metallurgists for developing alloys like that!

"As to our power source—I suppose you know that we have here one of the seven existing Starbuck thermo-borings . . . a six-mile shaft tapping the earth's internal heat. These are practicable only in very rare circumstances, when the cost of fuel is absolutely prohibitive. I'd hate to figure out how much this boring cost us. We sank it with a modified Starbuck teredo, powered by short range radio beam. We disliked using such an inefficient method of power transmission, but five or six miles of power cable hanging straight down is quite a load. You'll see some of our big teredos at work later on."

They crossed the dynamo room and entered a concrete chamber beyond. The great steam manifold from the turbines led into this room and passed through a formidable series of regulating valves to the head of an eighteen-inch pipe. This was the main which drove six miles down into the earth to tap its limitless sources of heat and energy. MacIntyre pointed out the smaller pipe, which passed down within the steam line and supplied the water to be vaporized by the high temperature. All the piping was heavily heat insulated, yet the chamber was exceedingly hot, and it seemed to Hamilton as if the air was quivering from the terrific tension of the confined steam. He felt as if they were standing over an immense boiler which might blow up at any moment; it was great relief to leave the valve chamber.

"We use the exhaust from the turbines to heat all our buildings," said the superintendent. "Of course the lower levels of the mine need no heating, the surface temperature has no effect down there."

Adjoining the dynamo room was the fan room; here great rotary blowers drew air in from forty-foot stacks above ground, warmed it over coils heated by exhaust steam, and sent it through ducts to all parts of the mine and buildings.

Next they visited the "residential section" of the little subterranean town, the main "street" of which was an especially wide corridor flanked by dormitories, recreation halls, a general store, a television and movie theater, eating halls—in fact all of the necessaries and many of the luxuries of life. Everywhere the colite tubes shed their radiance, a pleasant illumination which closely approximated sunlight. The air was kept fresh and mild by the ventilating system.

On the other side of town was the "factory district." Here were extensive mechanical and electrical shops for the maintenance of mine machinery, of the ore tractors, and of the company planes. Here also was the ore-dressing department—a series of great halls, filled with massive pulverizing machines, sizing machines, hydraulic and centrifugal classifiers, and concentrating tables—all of the apparatus for preparing the ore for the actual refining. The ore was received at one end of this series of machines as a mixture of beryl and granite pegmatites—the latter chiefly quartz and feldspar, and after traversing it, emerged as fairly pure aluminum beryllium metasilicate ready to be shipped. The ore dressing department was an inferno of noise, but even here the air was quite pure, as all the machines which handled the ore dry were enclosed completely and their "fines," or rock dust, were removed pneumatically.

The final product was conveyed to loading hoppers in an adjoining department. Under these the freight tractors received their cargoes, which they carried up a ramp to the great doorway Hamilton had seen from his window. Besides the tractors, there were a number of cargo sledges to be towed by the more powerful machines.

"We'll have to excavate rooms here somewhere for the new machines," MacIntyre shouted into his companion's ear against the roar and rumble of falling ore.

"Yes—Hardman figured you could make it by digging into the south end of the hall!" the metallurgist roared back. "Let's get out of here and go down into the workings!"

They followed the great endless chain ore-conveyors to the head of the main shaft and were dropped five hundred feet in the cage with qualmish speed. The shaft was double, and provided for the operation of a cage, an ore hoist, and for the great main ventilating duct, hydraulic mains, and electric power cables.

They stopped opposite a deep shelf cut into the shaft wall. The six-foot mouth of a circular concrete lined tunnel yawned opposite them. Several large power cables, a branch from the hydraulic main and one from the ventilating duct vanished into it. A flexible tube, about eighteen inches in diameter, also led out of the tunnel and ended in an ore hopper. From its mouth, at rhythmic intervals, a slushy mass of ore and water poured into the hopper. This Hamilton recognized as the ingenious "peristaltic conveyor," a device for conveying semi-liquid materials by the same alternate contraction and expansion of its walls that carries food through the aesophagus and intestine of the animal system. It was built of a series of sliding rings operated by powerful solenoids. Current impulses were supplied to these solenoids, in the proper order to produce the peristaltic motion, by a simple commutator, which corresponded to a ganglion of the nervous system. The whole tube was enclosed in a heavy flexible coating for protection. Altogether it was a very ingenious solution of the problem of transportation of crushed material, as it could easily be laid around corners and through constricted areas.

The two men picked their way along the tunnel towards its head. At first the gurgling and scraping of ore were audible in the conveyor, but as they advanced it was drowned out by an ear-splitting grinding roar from ahead. At last they reached the tunnel-head and the source of the racket—a "teredo" tunneler. Here was another machine, for which nature had furnished the inspiration. Like the little mollusc, its namesake, it bored its way slowly forward, and as it progressed, lined its burrow with a strong quick-setting concrete.

For a while they stood at the rear watching the slow, irresistible progress of the mass of mechanism. A continuous stream of ground ore spouted from an opening in its back, was mixed with water, and dropped into the maw of the peristaltic conveyor. Extra lengths of the tubing were stacked to one side, coils of electric cable were under foot, and puddles from the leaking water joints gleamed in the dim tunnel lighting.

They entered the rear operating compartment, which was like the inside of an early submarine. Here an engineer was regulating the apparatus which mixed the concrete and which exuded it in viscous stream from openings around the rear of the machine. Farther forward were the controls for the driving mechanism—the

powerful motors which rotated the outer shell with its screw threads of lambda-tungsten carbide. The whole front was filled by the motors that drove the synthetic-diamond tipped cutters which ground their way steadily into the rock ahead. They vibrated like an electric massagist and the grinding roar from the cutters made even thinking, much less talking, almost impossible. After a few minutes Hamilton could stand it no longer and retreated back along the tunnel. MacIntyre followed, mopping his brow.

"The men who operate those devilish machines are the highest paid mechanics we have. They sure deserve what they get!"

"I can understand where all the power from those turbines goes," said Hamilton as they walked back to the shaft. "Those contraptions must use a terrific amount."

"Yes, one teredo requires about three thousand horse power. We couldn't build motors to deliver that power and still take up so little room if we didn't use super-malloy for the armatures and field cores. It's also used in the solenoids of the peristaltics."

By the time they reached the mine head and made their way back to MacIntyre's office, it was time for the evening meal. The mist outside was almost as light as when Hamilton arrived, for it was December, and the sun was not yet dipping below the horizon.

After supper Hamilton talked further with the superintendent concerning the new plans. MacIntyre promised to send them back to Melbourne in a week's time with whatever modifications he or his staff found necessary. The chemist turned in early as he planned to take the mail plane that left for Little America at five-thirty in the morning.

ON the morning of the day after he left New Sidney, Hamilton arrived in Melbourne. He had had a three-hour wait in Little America between connections which he had spent in seeing the sights of this unusual port. It was then at the height of its season of activity, the pack had broken and the powerful ice-breaking ore vessels were plowing their way into the Bay of Whales to pick up their cargoes of ore and buffet their way northward. The great stores of ore, which the freight tractors had been piling up during the months when the port had been icebound, were diminishing. The town was perpetually noisy with the clatter of ore loaders poking their steel snouts into the holds of the dock vessels, with the clank and roar of incoming tractors, and the more musical tones of the motors of arriving or departing freight dirigibles and passenger liners.

At thirteen o'clock the Melbourne *de luxe* flyer took off with Hamilton on board. He passed the monotonous hours of daylight over the grey south Pacific reading and working on ideas for the new ionic separator, his favorite brain-child. Towards dusk the weather became a bit too heavy for writing. He switched off his reading light and gazed out of the cabin porthole into darkening cloud wracks scudding by. Far below gleamed the lights of a vessel—probably one of the S. P. B. ore fleet.

At twenty-two o'clock, after a light supper and a glance at the television news service, he went to bed. The air was rather bumpy and the big plane rode uneasily, so he snapped the safety belt across his narrow berth before he dropped off to sleep.

Some time later he was aroused by the cessation of the motor hum and vibration. Water was lapping against the hull and outside the dark porthole, lights were flashing and voices murmuring. This was the stop-over in Ivercargill at the southern tip of New Zealand, for refueling and motor checking. He knew it would not be long before daybreak, but they were not due to arrive before mid-morning, so he turned over and went to sleep again, while the great plane winged its way steadily westward across the New Zealand sea.

Preparations

HAMILTON spent over a month after his return from New Sidney in making ready the commercial unit of his ionic separator for transportation and insulation at the mine. The difficulties were increased greatly by the necessity for secrecy. He and the engineer, Hardman, were forced to arrange for the construction of vital parts at different electrical shops and together they assembled them. At the same time they kept in communication with MacIntyre, who had checked over the installation plans and was proceeding with the necessary enlargements and construction of auxiliary apparatus. As the winter was approaching, and it would soon be impossible to get in by ship to Little America, Hamilton speeded up his preparations as much as possible.

By February sixth, thanks to an extra appropriation made by the board of directors, the first industrial size ionic separator was completed and had been stowed in the freight hold of the *Vulcan,* one of the fastest and newest ore carriers.

And early next morning the powerful craft dropped her pilot off Point Nepean and turned her armoured prow stubbornly into the great grey seas of the roaring forties. For four days the *Vulcan,* in ballast, wobbled and butted her way southward and eastward. Hamilton spent most of this time with the ship's officers on the enclosed main bridge, in the officer's mess, sometimes up on the open flying bridge with the wind and spray splashing against his oilskins, or down in the engine room where the immense oil turbines roared in captivity. He enjoyed the trip immensely, in spite of the fact that he had to hang on to something whenever he wanted to remain upright; repeatedly he was rolled out of his berth and for one horrible morning was helpless in the grip of *mal de mer.* These tough ore carriers were not equipped with any such luxuries as gyroscopic stabilizers.

She drove relentlessly on at her moderate thirty knots and on the fifth day the wind having blown itself out, they entered the realm of floating ice. Here speed was reduced to twelve knots, extra lookouts were posted and an officer was always on duty at the "iceberg indicator." This instrument was essentially an exceedingly delicate horizontally acting balance which responded to the attraction of any mass great enough to be dangerous within a range of several miles. Of course, the *Vulcan* was an ice-breaker, and with her tough alloy steel ribs and plating could stand a lot of beating. Yet to ram any of the huge flat-topped icebergs which sometimes appeared in these waters would have been injudicious, to say the least!

After twenty hours of this cautious progress they came within sight of the magnificent rugged sea-face of Ross Barrier. In another hour they were entering

the Bay of Whales, to the sound of splitting ice slabs shattered by the *Vulcan's* sharp prow. The snow-laden buildings of Little America came into view, clustered at the edge of the white shore line. By the water's edge were the docks cut into the barrier itself, each with its black ore-handling machinery beside it; farther inland could be seen the dirigible mooring mast with a cluster of hangars near by. A ship lay in one of the basins; the roar of her loading with ore accompanied the shouting of orders and the clatter of winches as the *Vulcan* docked.

Over the Tractor Trail

THE freight tractor *Boanerges,* having delivered her ore, had been ordered to stand by to receive the *Vulcan's* consignment of machinery. Hamilton watched with interest the transfer of his crated and canvas-covered separator from the hold of the sea-going vessel to that of the land vessel. A powerful electric crane dropped a cable down into the *Vulcan* where slings had been rigged; silently and smoothly the heavy mass of delicate machinery rose, swung in an arc, and was swallowed without a jar by the open number one hatch of the *Boanerges.* Her skipper, a likable and efficient young man, stood by supervising the stowage. Under his orders the job was done in an hour.

He explained to Hamilton, "I am anxious to start as soon as possible. We have been having unnaturally good weather, and I want to be well on my way before it cracks. If we can get through the Pass before then, I'll be satisfied."

Hamilton accepted the hint and soon climbed the little steel ladder leading to the topsides of the *Boanerges.*

The greater part of the flat deck was taken up by a row of five steel loading hatches. Forward was a low deckhouse terminating in a rounded glass control room. A small sturdy door opened on either side to the interior. He entered to deposit his suitcase and found himself in a narrow longitudinal corridor. Forward it opened into the control room—aft was a steel stairway leading down—presumably to the engine room. Two small rooms flanking the entrance way opened off the port side—the galley and washroom; on the starboard was one larger compartment. Doubtless the "officer's saloon," thought Hamilton, as it boasted leather upholstered benches against the wall. Heavy glass ports illuminated all the rooms except the control room, which was provided with wide vision windows. The whole thing was an odd combination of the atmospheres of land and sea travel.

Sounds of activity were drifting up from the engine room—the clinking of metal and murmuring of voices. A muffled throbbing of pumps resounded through the cabins; then a loud stuttering hiss—the air starters were spinning the turbines. A few preliminary coughs and spurts and the *Boanerges* vibrated gently with the deep rumbling exhaust of her idling engines. Outside, the closing of the hatches was about completed. The skipper came running nimbly up the side followed by another young man in the company uniform.

"Mr. Hamilton, meet Mr. Fellows, our radio operator and electrical man. If you have any questions he'll be glad to answer 'em—you'll excuse me for a while—I have to take charge now."

He entered the control room and sat down in the pilot's seat. Before him were the throttle and reversing levers for the port and starboard turbines, the clutch control, and the revolving pointer of the "ratio control" which varied uniformly the number of revolutions which the turbines made to each revolution of the drive wheels. At the minimum setting, or "high," with open throttle, the *Boanerges* could make about nineteen miles an hour on the level. At the maximum setting, her tractive effort was terrific. The use of turbines in this field was made possible by the famous Voight transmission, which provided positive mechanical connection between engine and drive wheel, and at the same time allowed the drive ratio to be uniformly varied.

He spoke into the engine room telephone: "Are you ready below, Mr. Frazer?"

"Aye, aye!" came back the answer.

With the ratio control at maximum, the skipper opened the throttles and slowly let in the clutch. Hamilton heard the increased roar of motors, felt the first lurch of the floor. He looked out a window—a few muffled-up bystanders were watching them—they passed out of range as the *Boanerges* heaved forward. The ratio was decreased, the throttle was opened a trifle more, and they lumbered with increasing speed up the packed trail, which led back from the little settlement.

"We'll have to stop at the roundhouse to pick up an empty trailer." Fellows raised his voice against the drumming of the exhaust and the clanking of the treads.

The roundhouse and shops for the tractors lay about half a mile back from the town. Around them was a great area of snow, packed and churned with grease from the continual maneuvering of the machines. Their trailer was ready for them, Hamilton watched the skipper as he skilfully backed into it so that the automatic couplings clicked with no help from the ground crew.

Once again they started—this time with the empty trailer lurching after on its six-foot runners. As he gazed ahead at the trail vanishing into the distance across the barren snow-covered barrier, Hamilton felt a thrill which the others, hardened antarctic travelers, seemed not to notice. The sky was heavy with rolling grey clouds. A few snowflakes drifted down. He walked to the rear porthole and looked out. The last buildings of Little America were out of sight, the *Boanerges* had become a tiny center of human achievement in the midst of a vast deadness of nature.

Hamilton went down the steel stairway to the crowded noisy engine room. He quickly made the acquaintance of the chief engineer, Mr. Frazer, and his assistant who were glad to show and explain the mechanism. The low steel-arched room was divided in the center by a runway with handrails. On each side were the long cylindrical main turbines, terminating in massive clutch-cases and Voight transmission housings, from which the drive shafts led to the rear worm-gears. There was no monotonous beat as in the engine room of a ship, for the speed of the turbines was always varying in obedience to the throttle as the skipper worked the huge machine over bad spots in the trail or around crevasses and obstacles in the route. When Hamilton commented on this to Frazer, the old engineer told him to come down while they were negotiating the Pass if he wanted to see the skipper playing the Anvil Chorus on the turbines and Voights. "It'll fairly shake the teeth out of your head to stand on that runway then—that is, if you're able to stand up at all," he concluded.

When the chemist returned to the deck house an hour later, it had grown perceptibly darker and snow was whipping by the ports with a lively breeze behind it. Fellows was at his instrument and was just speaking to the skipper as he entered the control room: "The *Cerberus* is about five and a quarter miles ahead, Sir; she's making about thirteen miles."

The skipper nodded. "Take another reading in ten minutes, and after that keep a check on her till visibility. We've got to be cautious in this weather." He peered ahead into the shifting veil of snow. "I guess I'll switch to cable control—can't see much out and the trail is beginning to drift over."

He put on a pair of headphones while Fellows explained to Hamilton: "There's a cable carrying one hundred cycle alternating current laid under the trail. We are equipped with a coil below that picks up the impulse, and all you have to do is to keep the sound in the phone at a maximum intensity, and you stick on the trail."

He turned to his range finder to take another reading of the distance of the approaching freighter. This instrument was a modified directional ultra-short wave transmitter and receiver with which all company tractors were equipped. It operated on exactly the same principle as military range finders except that it utilized extremely short radio waves instead of light waves. The instrument indicated now that the *Cerberus* was only two miles ahead. Accordingly they proceeded at reduced speed till a light gleamed through the falling snow and rapidly resolved itself into the dazzling headlight of the other machine. With a thunderous roar its snow-covered bulk passed and was gone.

FOR several hours they continued the monotonous progress southward. Hamilton retired to the saloon and tried to read, but everything jiggled too much for comfort, so he went into the little electric galley and fixed himself a cup of hot coffee and a sandwich. Occasional glances through the port revealed an ever darkening landscape and an increase in the strength of the wind until a regular antarctic blizzard was howling and shrieking around the *Boanerges*. It was impossible to see more than twenty or thirty feet; they were navigating entirely by cable piloting.

Late in the evening the odometer registered ninety miles from Little America. The route swerved easterly and began to climb—this was the start of Rhyker Pass, which penetrated the Charles Bob Mountains at a maximum altitude of nine thousand feet. The roar of the exhausts became a little deeper as the skipper advanced the throttle and increased the drive ratio. Hamilton went forward into the control room, dark but for the glimmer of a few instruments. The powerful headlight bored ahead with a shaft of brilliant light, which was soon lost in the almost horizontal drive of small dry snowflakes. Gradually the slope became greater, the engines were beginning to labor. Shadowy cliffs were closing in on either side, the route began to twist and serpentine. The headlight dimly picked out black, piled up masses of rock sweeping out into the night—the base ribs of the mountains through which they picked their way. The tortuous route kept the skipper on the alert, as with skilful manipulation of the throttle and ratio levers he jockeyed the huge tractor through winding canyons, around hairpin turns, always following the sinuosity of the trail as it fought its way upward. Suddenly he threw out his clutches and flicked off the throttle; the roar of the turbines died and left a silence broken by the whistling of the wind.

"What's up?" ejaculated Fellows from his seat before the radio instrument.

"The cable note has stopped!" The skipper took off his phones and handed them over; they were silent. There was a momentary pause, as the two men looked questioningly at each other. It was interrupted by the characteristic high-pitched hum from the phones which had suddenly become active again.

"What the devil! I've never had that happen before!" The skipper switched off his engines, "phone cable stations eight and nine, see what they have to say."

Fellows worked at his instrument for a few minutes. "They noticed the break, too," he reported, "but they can't explain it. The operator at number nine thinks the reactance of this section has been thrown out a few henrys. Probably due to a slight break or disarrangement somewhere along the route."

"Tell him we are proceeding at reduced speed," the skipper replied, "there's nothing else to do—we can't sit on our treads out here indefinitely."

The turbines resumed speed and the *Boanerges* lurched forward into the obscurity. In her control room the men peered anxiously ahead in a useless attempt to pierce the impenetrable curtain of snow and gloom. The cable note was steady again and everything seemed normal, but Hamilton was troubled by a fear of what might lie just outside of their tantalizingly small range of vision. A foolish, nameless fear; for what beast or entity hostile to man existed in these barren regions! The grim antarctic was a jealous enemy, it neither permitted nor required allies or rivals in its cruel war against mankind.

For an hour more they continued their tortuous upward progress. The skipper was unusually alert for signs of danger—perhaps a snow slide across their path, or a break in some bridge or fill which carried the trail across a bad spot. But nothing out of the way happened, except perhaps, when he half turned in his seat and muttered to Hamilton: "I could have sworn that was Thunderstone Cut we just passed through—and if it was we ought to be turning about fifteen degrees easterly right now—but I'll trust the cable before I trust my eyes in this weather."

The route was becoming more and more uneven and difficult; the snow in the pass through which they were progressing seemed to have drifted to an unusual depth. The *Boanerges* heaved and pitched violently, her engines roaring at full blast as she nosed and fought her way forward. A burst of profanity came over the engine-room telephone from Frazer, enraged over the way his precious turbines were being overloaded.

With overwhelming unexpectedness a rocky wall loomed in the headlight's beam. Simultaneously the *Boanerges* lurched sideways and downwards—her crew thrown in a heap at the lower end of the steeply tilted control room. Like despairing souls the turbines shrieked in *crescendo* up from the engine room. The skipper had released the clutches but had been hurled from his seat before he could turn off the power. The shriek died away to silence as the automatic over-speed relays came into action.

The three men untangled themselves from the heap

Simultaneously the Boanerges lurched sideways and downwards—her crew thrown in a heap at the lower end of the steeply tilted control room.

into which they had been hurled. Hamilton felt an acute pain in his left wrist—probably sprained. Fellows was cut in the forehead—the skipper was bruised but not seriously injured.

He scrambled to his feet and ran aft to the engine room companionway, "Anybody hurt?" he roared down. The stream of vituperation which shot up from below assured him that all was well. The traditional contempt of the black gang for the deck force was very much alive, and possessed an eloquent voice in Mr. Frazer.

He returned to the saloon and yanked on his boots and furs. "Fellows," he ordered, "inspect all apparatus and equipment for damage. Mr. Hamilton, as a passenger, I must ask you to remain out of the way and not endanger yourself. I'm going outside to look over the situation." He snatched up a powerful electric hand lantern and hurried aft through the main corridor and up the sloping deck to the port entrance way. A gust of snow and chill swooped in as he stepped out, and the heavy door clanged shut.

Hamilton could see the flash of his lantern through the ports as he made his way forward along the narrow deck which ran on either side of the deckhouse. His muffled form swung over the side by the boarding ladder and passed out of sight.

Inside the great stranded machine there was silence, broken intermittently by the clink and scrape of metal or the occasional whirr of motors as the crew tested apparatus for breakage. Hamilton was in the control room, dividing his attention between the radio man tinkering with his equipment and the murk outside, in an attempt to make out the skipper's light. It winked and flickered below under the great tilted hull of the *Boanerges*. He watched, fascinated, through the observation window. The light moved slowly aft as the skipper examined the condition of the immense caterpillar treads. Suddenly the tiny beam swung about, flashed crazily. A jet of flame pierced the darkness beside it, accompanied by a faint report, which reached his ears through the thick glass. The lamp flew upward in a glittering arc to fall and extinguish itself.

Hamilton leaped away from the window, a cry of warning on his lips; but the same instant a *staccato* rapping on the glass arrested him. He spun around and looked—a figure muffled in snow whitened packa was standing outside, a Kruf automatic in its mittened hand covering the two men within. Hamilton stared, frozen with astonishment, but Fellows dashed to his radio telephone. Instantly the automatic blazed and the whole instrument panel burst in a sheet of flame where the explosive bullet struck it. The lights blinked out and Hamilton dashed in the direction of the corridor to escape the murderous fire through the observation window.

A little light was gleaming through the engine room companionway aft; he leapt towards it in a frantic effort to get out of the way of the next shot. Simultaneously a man stepped into the corridor from the side entrance, Hamilton crashed into him and clutched wildly. His impetus carried the two men over the edge and they hurled down the iron ladder into the depths of the *Boanerges* bowling over Frazer, who had just started up to investigate the shooting. They landed at the bottom, a fearful scramble of arms and legs, Frazer, enraged at the unreasonable assault and Hamilton, almost out of the running from the battering and the pain in his wrist.

"Bandits!" he croaked, as he got dizzily to his feet. "They shot the skipper when he went outside—and I think they got Fellows!"

"This one of them?" snapped out Frazer, leaning over the third man who sprawled out on the steel floor, ungainly in his heavy furs. He had been knocked unconscious.

"Hey, Tom," he called to his assistant, "lock up this fellow in the store-room when he comes to. I'm going out to take a look at these bandits. Has anyone here any firearms?"

No one had, not even the unconscious captive—probably it had been jarred out of his hand when Hamilton struck him. "Then give me a monkey wrench and I'll show them a thing or two," growled the old engineer. "This begins to sound like old times!"

"Wait a minute!" put in Hamilton, "give the younger generation a chance, Mr. Frazer. I want to join the party too. I ran off like a scared rabbit and left Fellows."

Frazer had armed himself with a pinch bar and Hamilton seized the largest wrench he could find. The two crept up the steel ladder and poked their heads cautiously above the corridor deck. Immediately they were dazzled by the beam of a powerful electric torch, while a gruff voice ordered them to "git below and stay below." By way of hastening their descent a Quinn air pistol sighed somewhere in the darkness and its vicious little pellet smacked into the bulkhead behind them.

Frazer grunted as he turned to descend. "Well, I guess we'll have to accept the invitation, but I sure wish we could return his calling card."

Hamilton said nothing; he had glimpsed an overturned suitcase, and he suddenly realized what the bandits were after. The ionic separator! Or rather the plans of it. They were all in a neat bundle in his suitcase in the saloon. A sickening impotency overwhelmed him. As if to emphasize it the heavy steel hatch over the engine-room companionway clanged shut. They were prisoners neatly bottled up in the interior of the *Boanerges*.

"Isn't there any other way out?" he demanded of the mechanic.

"Nope," laconically replied that grease-smeared individual, as he seated himself in the crook of the port oil-feed manifold and pulled out a pipe, "less you can crawl out one o' them ports." He waved in the direction of a small heavy glass light set in a deep recess of the engine-room walls. Hamilton hurried over to it, cupped his hands to shield his eyes, and peered out. At first he could make out nothing, but gradually he saw through the murk the shape of a small motor sled, a dim light burning in its cabin. It lay directly under the port-hole like a tug beside an ocean liner.

He beckoned to Frazer and showed him his discovery. "If we could only smash up that sled—then they'd have no way to escape!" He turned excitedly to the engineer, "a heavy piece of iron dropped out of this port——"

"—wouldn't work," cut in Frazer, "we couldn't get anything heavy enough through here to damage that machine."

"We've got to think of something!" Hamilton's voice was tense—"I've got it—don't your discharge hatches open along this side?"

"Yes."

"What've you got in the compartment above us?"

"Let me see—stowing's not my job—" Frazer knitted his brow—

"Cement!" cut in the laconic engineer, suddenly come to life—" two hundred bags of it—twenty tons!—that'll smash 'em!" He dashed over to the control panel of the hydraulically operated hatch locks. Hamilton hurried up the ladder and secured the hatch to the deck house firmly from the inside.

"We'll make our prison into a fort," he muttered, "that's double-crossing 'em!"

The engineer threw over the lever for number three hatch lock to release. There was a momentary roar over-

head as twenty tons of cement slid out of the open hatch. The crunch of the smashing motor sled was scarcely audible through the thud of the falling bags.

OVERHEAD was a cry of alarm and the patter of feet on the deck.

'We'd better put out the lights here," cautioned Frazer, "if they can break through the hatch and get at us now, they'll do it." They waited in darkness for the attack, which came soon. The bandits, enraged at the coup which cut off their means of retreat, were apparently determined on revenge. The steel hatch rang to the impact of an explosion, which was followed immediately by another.

"Kruf impact nitro shells—thirty-eight calibre, I should say," muttered Frobisher. "If that's all they have, they'll never get through that hatch."

The attackers seemed to realize the futility of attempting to penetrate the steel-bound vitals of the great tractor. Sounds of an angry altercation came through to the men within. There seemed to be only two voices—apparently the gang consisted of only three men; and one was locked in the storeroom.

Frazer approached the hatch and shouted up "'Ahoy above! you might as well give up peaceably. If you don't we'll just turn off the deckhouse heat and sit tight till you freeze to death. I presume ye aren't crazy enough to try to mush out o' here; and you know you can't get at us!"

There was silence. After a time the two voices broke into argument. They increased in violence; apparently there was fatal dissension. The argument culminated in a deafening series of detonations on the hatch top—someone must have discharged the whole magazine of a Kruf against it. There was a yell of rage, a clatter of metal and the sound of heavy running footsteps. For a few minutes all was silence, then the footsteps returned and someone rapped sharply on the hatch.

"All right you below! I know when I'm licked. Open her up and lemme get warm. I been runnin' around in this dam' icebox long enough."

"Okay!" sang out Frazer. "We'll open this hatch a couple of inches and you drop your artillery through. No funny business or you'll stay there and freeze solid."

He released the fastenings so the hatch could be raised a few inches, and immediately a mittened hand dropped two Quinn air pistols and an automatic. Hamilton and the mechanic picked them up and covered the stairway as Frazer released the catch. A man in heavy furs appeared in the opening, his hands raised above his head. He descended the stairs sullenly under the intent gaze of the three men.

"Search this fellow for any more weapons," snapped Frazer, "then lock him in the storeroom along with the other. He goes to the sheriff at New Sidney with a charge of piracy and murder"—he swung toward Hamilton—"you and Tom here take these pistols and we'll look for the other one we heard."

"No need of that," growled the captive, "he went plumb nuts and jumped off the deck out there. And there's been no murder done here, either. I plugged your skipper with a hypo bullet and he's still asleep—in the washroom along with your radioman. Lucky for me Strauber didn't blow him to pieces. I sure wouldn't have taken on this job if I'd a known that guy would try to bump off everybody."

"Strauber, you say?" asked Hamilton.

"Yeh. He was the chief of this idea. Crazy little dark fellow—but he had brains and he had this job all figured out fine. We was gonna hold up the payroll, but we got word somethin' mighty valuable was comin' through on this machine. Everything was going fine till you dumped that load of stuff. Damn his brains! Why didn't he think of that?" He sat down wearily. "And after two weeks of the hardest work I ever did."

Hamilton and Frazer went up after the two casualties. They were locked in the washroom, the skipper in a stupor from the effects of the hypodermic bullet and Fellows weak from loss of blood and dangerously chilled. The deckhouse had become bitter cold with the air from the broken window. They carried the two men down to the warm engine room, dressed their wounds and made them as comfortable as possible.

"What are the chances of getting these men medical attention?" Hamilton asked Frazer. The engineer thought that the section patrol would be along pretty soon, since the failure of communication of the *Boanerges* would certainly arouse the operators at cable stations eight and nine.

"You're wrong about any section patrol comin' along here," said the morose bandit whom they had not yet locked up, because he seemed willing to give information. "We're six miles off the trail now!"

"You're crazy! We're on the cable!"

"You're on a cable—but not the right one. Just below Thunderstone Cut we spliced on another section and carried it up this blind canyon. Then we ran it back over the divide to the main cable again to keep the circuit goin'. We put automatic switches at the splices to cut the fake section in and the main one out just before you were due. In forty-five minutes they'll throw out this section again and nobody can tell there's been any tampering—that is, not until they dig up the whole thing some day and find our splices. Boy, that was some job!"

"And now somebody's got to mush six miles to the fork and flag the section patrol," said Frazer grimly. "In a storm like this that's no child's play. But these men have got to have medical attention."

"Wait a minute," interrupted Hamilton. "How soon will those automatic switches disconnect this section of the cable?" he asked their captive.

"I think in about ten or twelve minutes now."

"Then hurry! Frazer, I want to get at that cable and send a message over it. Get together something to dig with and an axe or a knife or something to cut the insulation."

The two men yanked on their heavy clothing and seized a few tools, a coil of bare wire, and an electric lantern. Hamilton led the way up into the deckhouse now rapidly filling with driven snow, and out to the deck and down the boarding ladder.

After a few minutes of scrambling around in the snow underneath the great snout of the *Boanerges,* they found the cable about twenty inches below the surface. Five feet was the regulation depth of the main cable—it was fortunate that Strauber had not been able to lay his false section properly.

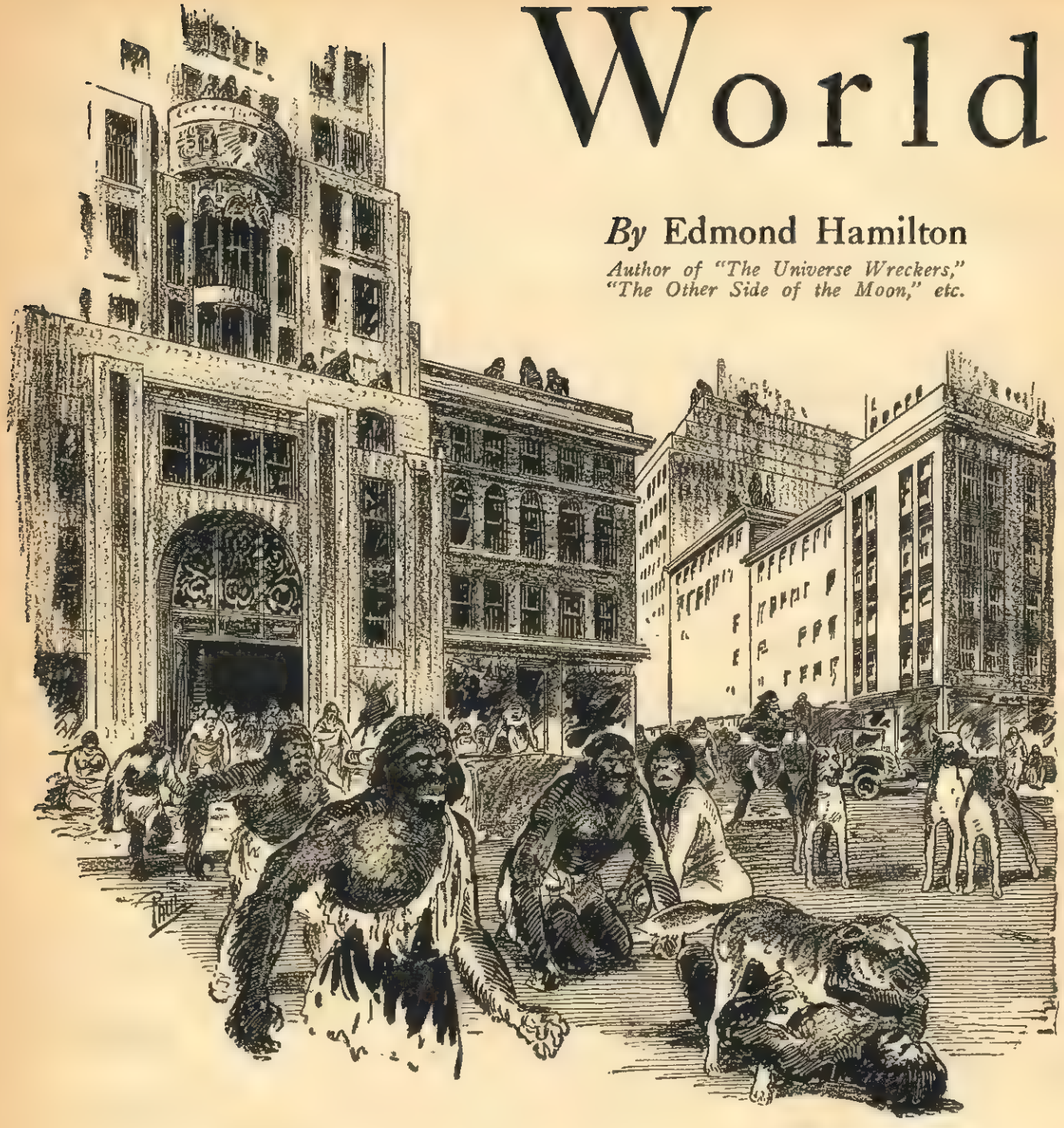
As soon as they uncovered it, Hamilton hacked away at the lead sheathing and insulation till he bared the

(*Continued on page* 468)

World

By Edmond Hamilton

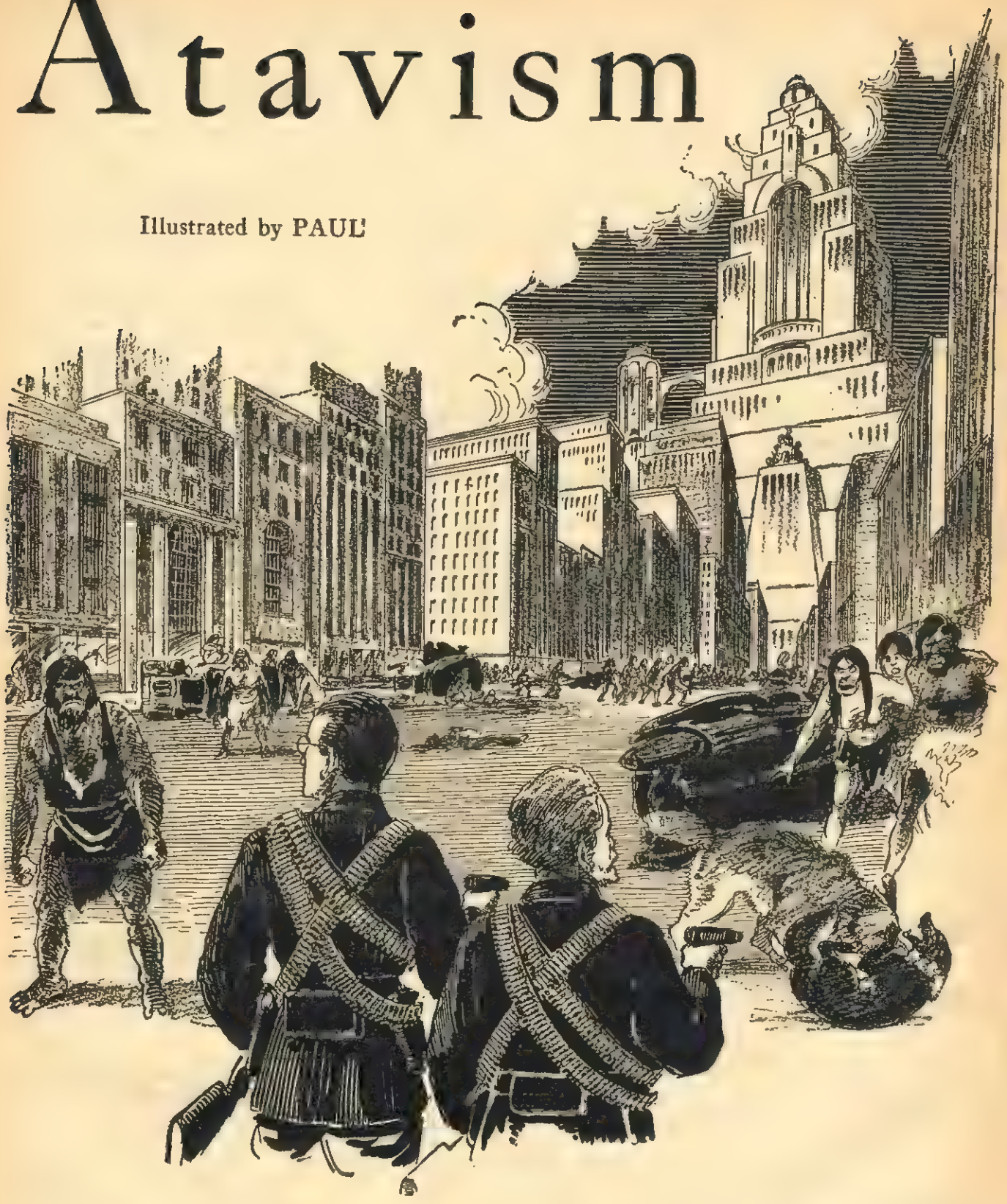
Author of "The Universe Wreckers," "The Other Side of the Moon," etc.



THE sun's rays have been credited with many beneficial powers. It is a universally conceded fact that the sun is necessary to good health; not only because of its warmth-giving rays, but also because of some other element, directly a health-giving factor, which has since been more or less successfully duplicated in the laboratory—in the form of Alpine lamps and what not. It is also said, however, that there are certain properties in the rays of the sun which might be used as life-giving rays. As far as we know, nothing definite has been established on this score yet. Who knows what other helpful possibilities are hidden in the various ether vibrations produced by the sun? Edmond Hamilton has a brand new idea, which he elaborates and weaves into a fascinating story of scientific fiction Certainly it seems to us to be of absorbing interest.

Atavism

Illustrated by PAUL



FOREWORD

I WRITE these words in a room perched high in one of New York's highest towers. Beneath me, in the fading sunlight of late afternoon, there stretches the vast mass of the mighty city's structures. New York it is—but such a New York as never man looked upon before. And it is with its familiar but infinitely strange panorama before my eyes that I start now this record of the great change.

MY name is Allan Harker. Dr. Allan Harker, I could say, for it has been seven years since I took the degree and with it a position on the biological staff of Manhattan Univèrsity. That was a great day for me. Manhattan was one of the most renowned of eastern universities, and its biological department in particular was known to scientists the world over. This was due not only to the department's unrivalled equipment,

but also in greater part to two of the scientists who worked in it, Dr. Howard Grant, head of the department, and Dr. Raymond Ferson, his associate. Very proud I was to have won so soon the opportunity of working with those two world-famed biologists. And even prouder I was when, in the next years, my work came gradually to link my name with theirs.

Grant and Ferson and Harker—we were known to scientists across half the world. It was Grant, of course, the eldest of us, who was best known. A tall, saturnine-faced and dark-browed Scotsman, his utter and undivided passion for research was a byword among us. It used to be said, though not in his hearing, that Grant would have vivisected his own grandmother if he thought some new principle might be learned by it. All respected the man, or the man's achievements, but he never had a tithe of the popularity that was Ferson's. Ferson was in fact a complete contrast to his superior, a short-statured man of middle age with unruly hair and beard and warm brown, friendly eyes. As for myself, the third of the trio, I had neither the brilliant scientific mind of Grant nor the keen vision of Ferson, but by dint of ceaseless plodding with monotonous details, I had built for myself a reputation that linked my name with theirs.

Aside from our professorial duties in the university's lecture-rooms, we had each of us our separate work. I was plodding away with my dull experiments on cell-grouping, which I expected would some day yield a theory that would astound all cytologists. Now and then I received help on some difficult point from Ferson, who was himself immersed in an attempt to demolish the Snelsen-Morrs re-vertebration theory by prying into the interior structure of innumerable unheard-of lizards. Grant, however, never received or gave any help, keeping his work entirely to himself. We had gathered, from his rare references to it, that he had been working for months on one of the broader problems of evolutionary science, but that was all we knew, and we were as amazed as any when Grant published the statement that touched off the sensational "evolution controversy."

It is needless for me to give here all the details of the thing. It is sufficient to say that Grant, in his statement, announced that he had solved at last the greatest enigma of biological science—that he had discovered the cause of evolution.

One can understand what an uproar that statement created, and was bound to create. For the cause of evolutionary change has always been the supreme problem of biology. Long ago Darwin and Wallace and Lamarck and their fellows had laid the processes of evolution bare. They had shown to an astonished world that life on earth was not static in forms that had always existed and always would exist, but that it was in constant change and movement up through constantly changing forms. The eohippus had changed, had evolved into the horse, and in future ages would be something different still. The great felines that had roamed earth had evolved into smaller forms and into tame cats. A certain branch of ape-like forms had evolved into great hairy troglodytes and then into modern men. All life on earth was constantly changing, evolving, forced ever upward through the diverging channels of evolution into new and different forms.

But what force was it that pressed earth's life thus upward through the paths of change? What force was it that caused all this vast, slow evolution of earth's creatures into different creatures, that had begun with the first jelly-like life-forms on earth and had forced the tide of life up from them to the forms of today, that still was slowly changing them? That question none could answer. Environment did not explain it, for though environment had certain effects on the life-forms in it, it was not responsible for that deep, vast tide of upward evolution. Mendelism had seemed for a time to suggest an explanation but had failed in the end to do so. Some great force there was, all knew, that pressed life always up the path of evolution, but none had ever guessed what that force might be, and the thing had come to be accepted at last as one of the insoluble problems of science. And now Grant claimed that he had solved it!

"For long," Grant's statement said, "I have held that since evolutionary change is unquestionably caused by some definite and omnipresent force acting upon all life on earth, it should be possible to discover the nature of that force. I will not recount the work of months which I have spent in constant search for this force, but will say that finally I have been successful, have identified the force which my experiments show beyond all doubt to be the single force responsible for the upward course of evolution on earth. That force is a vibratory force, a vibration unknown to earth's physicists prior to my discovery of it, which has as its source the sun!

"The sun, we know, is a vast mass of incandescent matter which ceaselessly pours out part of its matter transformed into energy. The energy thus formed, flooding out in all directions from the sun through space, takes various forms. At a certain vibratory frequency, it takes the form of light and illuminates our day. At another frequency, it is radiant heat, warming our world. At still another, it is the cosmic ray so recently discovered. There are many others, known to us, and still more of which we know nothing as yet, a vast welter of vibratory forces flooding endlessly outward from the sun. And it is one of those vibrations, one which we well may call the evolution vibration, which is responsible for the evolutionary change of all life on earth.

"In this there is nothing astounding. The sun's various vibratory forces affect all living things on earth profoundly, each in a different manner. Without the light-vibrations earth's life would fade and die, the absence of the ultra-violet waves being fatal in time. Without its heat-radiations all life would freeze. And without this evolution vibration playing ceaselessly upon earth, all life upon earth would no longer be pressed upward through the paths of evolution, would slip back swiftly down those paths, down the myriad roads up which it has surged for so long. For not only is it this evolution vibration that forces earth's life upward on the way of change, it is this vibration that keeps earth's life from slipping backward!"

Thus for Grant's statement. To Ferson and me it was as astonishing as to the rest of the scientific world, for not until then did we learn what work it was that had occupied Grant for so long. Yet even we two, I think, were surprised at the sensation that that statement caused. Always the work of Dr. Grant had been accepted almost without question, so great was his reputation and so brilliant his achievements. But with the publication of this amazing new theory of his, the general dislike of the man that had always lain latent, burst forth into a storm of criticism.

It was admitted that the new vibratory force which Grant had discovered did apparently exist, since other scientists working on his data had corroborated his

work on it. But it was denied, by Grant's numerous critics, that this force was what he claimed it to be—the cause of evolutionary change. It was impossible, they stated, that such a so-called evolution vibration could in reality be responsible for the course of evolution on earth. And it was even more absurd to suggest as Grant had done that were that force withdrawn, were the evolution vibration to cease to play on earth from the sun, the living beings of earth would slip swiftly backward on the road of change.

The controversy over the thing grew, in fact, to a point of bitterness unprecedented in scientific discussion, a bitterness intensified by the comments of the saturnine and black-tempered Grant. In a series of sardonic statements, he compared his critics to those who had derided the work of Darwin and his fellows, and indulged in some rather acrid personalities. These in turn provoked fiercer attacks, and the whole matter grew thus quickly into an unseemly intellectual brawl. To Ferson and myself the whole controversy seemed a useless one, because, in the course of time, experimentation by other scientists would definitely prove or disprove Grant's theory. Yet neither of us ventured to suggest that to our bitter superior, and so the wrangle grew in intensity in the next days until it suddenly came to a head.

It was the elderly President Rogers of Manhattan University who brought the thing to a focus. He and the university's other officials had been growing more and more restive under the criticisms that Grant's controversy was bringing on the school, and so at last he suggested that a meeting be held at which Grant could lay his theories and data before his fellow-scientists in their entirety. This Grant accepted, and so too did most biologists of any note within traveling distance of New York, so widely had the clamor of the dispute spread. And on an afternoon Grant rose before several hundred assembled scientists in one of the university's lecture-halls to explain his discovery.

There is little need for me to tell at length of what took place at that meeting, which both Ferson and I attended. At the first appearance of Dr. Grant his enemies in the audience grew vocal in their criticisms, and before he had spoken a quarter of an hour the hall was in such an uproar as a scientific meeting has seldom heard. Twice Grant made an effort to go on and each time his voice was drowned by a storm of shouted cries. The President, chairman of the meeting, was rapping vainly for order, but Grant only stood still, looking out over the stormy meeting with a cold contempt in his eyes, yet with a strange fire in them. Quietly he rolled up the data-sheets in his hand and thrust them into his pocket, and as quietly stepped forward to the platform's edge. Something in his bearing, in his expression, quickly quieted the noisy throng before him.

His voice came out over the hall cold and clear. "You have not let me give to you the proof for which you asked," he said.

The President stepped to his side, said something rapidly, but Grant shook his head calmly. "No proof that I can give you here would convince you of my theory's truth, I know," he told the silent throng before him, "but I will give you proof of it yet! To you, and to the world, I will give a proof such as the world has never seen before!"

Before any could move, he had walked from the platform and out of the hall. A buzz of excited voices broke out instantly, in comment and criticism. It was some hours later before Ferson and I got from the meeting to Grant's laboratory. But Grant was not there.

Within twenty-four hours more we knew, and all at the university knew, that Dr. Grant had disappeared. From the meeting he went to his laboratory, burned some papers there and pocketed others. Then he went to his rooms, hastily packed a few bags and departed. He left no note, no message. His action brought to a climax the whole sensation of the controversy he had precipitated and Grant's going was taken by many of his critics as a confession of the falsity of his position. He had had no close relatives to start a search for him, and though to Ferson and me his strange departure seemed astounding, we could explain it no better than others. The sensation subsided, and Ferson was appointed to head the department in place of the vanished scientist. Our own work occupied us once more. And certainly neither Ferson nor I, any more than another, guessed what lay behind Grant's strange action.

IT was six months after Grant's departure that the great change began.

The first intimation was brought to the public notice by a New York newspaper. In a sensational article entitled "Is a New Crime Wave Upon Us?" it pointed out that in the last few days an unprecedented number of crimes of violence had taken place.

These were the more appalling in that many seemed quite without motive. In New York alone, in those few days, there had been more than a dozen murders, mostly clubbings and stabbings, which had apparently been provoked by the slightest of causes. In Chicago a respected clerk of middle age had for some annoyance turned suddenly and fractured the skulls of three of his associates with a heavy bar. From San Francisco and Los Angeles had come news of half a dozen holocausts in which one member of a family had slaughtered or attempted to slaughter all the others. From every part of the land there were coming reports of the most horrifying crimes of violence, the great majority of which seemed inspired by the pettiest of causes.

And this same wave of homicidal mania seemed at work over all the world! It was as though hundreds in earth's population had suddenly had their reason dwarfed and their passions magnified. No less than three solid householders in London had run amuck in bursts of sadistic* fury that had cost a half-score lives. The Paris police had taken from the Seine more human bodies, many terribly mutilated, than had ever been found in it in a like time before. Germany was aghast over two mass-murders of unexampled fiendishness that had occurred in a Rhenish and a Silesian village. There was news of an even more terrible slaying in Calcutta, and word of murders almost as terrible from almost every country on the globe.

Nor was it murder alone that was stalking the earth, for robberies of the utmost brutality were even more numerous. Overshadowed as they were by the greater horror, they were as astonishing in nature. For all, like the slayings, seemed the result of sudden brutal instincts or desires uncontrolled by reason. Small shopkeepers in American and English towns were struck down for trifles. In the stores of great cities there were those who snatched childishly at desired objects and attempted a hopeless escape to the street. That was the keynote of all

*Sadism, of which this word is the adjective, is a mental perversion towards cruelty.

these robberies, of all these crimes—the unreasoning childishness of them. For the great part of them were attempted under circumstances which should have shown to even the most dull-witted that there was no chance of success.

It was a wave of strange and terrible crime, indeed, that was sweeping over all the earth. The newspapers concerned themselves with it to the exclusion of all else soon. They sought for explanations. What had caused this sudden release of the most brutal passions of numberless people? Many were the answers. An eminent scientist declared that the nerve-racking strain of modern civilization had reached such a pitch that the human mind could no longer stand it, was giving way beneath it. Many wrote serious letters to the press denouncing the motion pictures as schools of crime. Others defended them. And while the cause was thus argued, the great wave of crime and utter lawlessness that had rolled across earth seemed increasing in volume.

The number of deaths by violence that were each day recorded had grown now to an appalling figure. Murderous attacks were common in every one of earth's great cities. Men hurled themselves at each other's throats, apparently for a word, a gesture. Nor was this all. A strange erratic insanity seemed seizing more and more of earth's millions. Numberless were those reported to the authorities as missing, those who had wandered causelessly away from home and family. The world's roads held an unprecedented number of vagrant wanderers.

But in a few days more even this astounding wave of appalling crime was dwarfed in importance by more astounding and more terrible happenings. Accidents, a great number of them fatal to many, were occurring in every part of earth in an amount that was all but incredible.

More than a hundred people had gone to death in the crash of two thundering passenger trains in Colorado, a crash that had been due to the failure of an engineer to heed the plainest of signals. Two train wrecks in northern England had taken a toll of life almost as great, and there were reports of many other crashes from various parts of earth. In every one the accident had been due to the inexplicable failure of the human element, the failure of dispatcher or switchman or engineer to perform the duty that habit should have made automatic. In one case, that of the Austrian disaster, the crash had been directly caused by the sudden craziness of a switchman, who, for some slight grievance, had sent a long passenger-train crashing through an open switch and down an embankment.

There was news as terrible from the seas. Wireless reports flashed thick with word of ships that had blundered fatally on rocks or shoals by fault of helmsman or navigating officer. The greater part of these, fortunately, were freight-ships of medium and small size, but one case sent a thrill of horror through earth, already steeped in horror. That was when the great transatlantic liner *Garonia,* bound to Southampton, crashed by night into the southern Irish coast with the resulting loss of three-fourths of the thousand humans it carried. And that wreck, like the others, was due to an utterly inexplicable failure of the ship's personnel.

Smaller in magnitude, but taking a total of far more lives, were the unnumbered accidents that took place in the thickly populated and highly mechanized countries of North America and Europe. The number of automobile deaths, always staggering America, reached a stunning total in those last fateful days of September. Crashes took place at every corner, and the running down of pedestrians became a common occurrence everywhere. Many cars mowed a path of death through street and sidewalk before they were halted, their drivers losing apparently all faculty of control of them.

And in mill and shop and factory death's grim hand was reaping as thickly. Men, upon whom the lives of many depended, suddenly lost control of their machines and sent those many to death. Countless others were mangled or crushed to death by the great mechanisms they had operated for years without mishaps. Airplane crashes became so numerous that many sections of the world peremptorily forbade all further flying until the cause of it all could be ascertained. It was as though more and more of the masses of men were becoming incapable of handling the mechanisms, of conducting the operations, that they had been executing for years. Was mankind going collectively insane?

It seemed insanity, indeed, that was sweeping earth now. Riots had taken place on a small scale here and there in those days, but it was not until after the first of October that the first of the great outbreaks took place in London. Crowds of wandering men and women began the looting of shops, the breaking of windows, and the rioting swiftly spread. So swiftly did it spread, in fact, that by the time the troops called to suppress it appeared on the scene, unestimated thousands were engaged in the wild search for plunder. At the order to fire, an irregular volley from the troops killed scores, but in the pitched mob battle that followed scores of the soldiers took the side of the looters. The combat between mob and soldiers was forgotten, and the battle became a wild scene of brutality and violence in which hundreds were slain and trampled. In the end it required machine-guns to disperse them.

A similar great outbreak in New York was curbed quickly a day later by the use of planes and tear-bombs, but two days after there came a huge riot of unexampled bloodiness in Chicago, which cost several thousand lives and which resulted in the burning of a third of the city. Beginning as a race riot and developing into a savage general battle for loot, it was notable for the fact that the troops, called to suppress it, broke up even before they reached the scene and occupied themselves in brutal looting and battle of their own. And a score of great riots in the other cities of earth had similar results.

Civilization seemed crashing, with this oncoming dissolution of its organization and institutions. Had humanity gone insane, indeed? Swiftly, with full realization of the peril upon it by then, a conference of the world's most noted scientists had been called some days before at New York, to explain and to halt, if possible, this wave of seeming insanity that was gripping more of the masses of humanity each day and that was disintegrating civilization.

But when those scientists met, the world learned that they had a hundred different explanations of the thing, no two agreeing. The famous American alienist who had voiced his opinion days before reiterated his belief that the minds of men were giving way *en masse* beneath the strain of modern civilization. A Rumanian bacteriologist claimed that the thing was the result of a contagious new brain disease spreading over earth, and claimed even to have isolated the bacterium of that disease. The scientists, gripped seemingly by something of

the erratic condition of mind they were striving to explain, argued these theories and others with utmost passion, sometimes attacking each other. An English physicist, who suggested that earth was passing through strange mind-affecting gases in space, was assaulted by the proponent of another theory. And still more furious and incredulous, the world learned, was the reception given to the explanation of a New York biologist named Ferson, who claimed that the whole great terror was the result of the human races slipping backward on the road of evolution!

"World atavism! A throwback of all the world's life on the road of evolution!" So, they learned, Ferson had cried to the assembled scientists. "All earth's animal life is beginning to slip back, and man, as the most recently developed animal, is slipping first, is going back toward the savage state, toward the cave-man or troglodyte, toward the ape! He is losing control of his passions as he goes back, which accounts for the violence that now fills earth! And he is losing the mental capacity of modern man, which accounts for his inability to operate longer our modern machines! A world atavism that is beginning with the atavism of the human races!"

"But what could cause such world atavism as that?" the incredulous scientists had cried.

"The evolutionary theory of my former associate, Dr. Grant——" Ferson had begun, but was interrupted by a chorus of derisive shouts provoked by the mention of the scientist whose ridiculous theory had been exploded.

So Ferson had been forced from the meeting by the furious scientists, who seemed seized indeed with the erratic craziness that was gripping the world. Another day they advanced and argued their theories, theories that grew ever more impossible, more incoherent, and then the meeting dissolved in a general riotous brawl of the arguing scientists. They, in common with the rest of the races of men, seemed incapable longer of calm thought, of cool, unpassioned reasoning. Two were killed, throttled in the brawl that ended the meeting, and the rest scattered. They were not followed or punished, for now the disintegration of humanity's institutions had become such that crime was unheeded.

Men were outrivalling each other in mad action. Those in high places as in low were gripped by the insanity that had apparently seized earth, and from the Cabinets and Congresses of a score of nations came declarations of war against other nations, for the slightest of reasons or for none at all. England, the United States, France, Germany, Italy, Turkey, Japan and China—these and a dozen others issued frenzied and incoherent calls to arms. But they were unheeded! Even war now could not penetrate the unreasoning minds of men. Armies had broken up, all discipline and organization vanishing. A few who tried to keep their soldiers in line found that the men could no longer handle the great guns and instruments of war, found that most of them were incapable of the operation of rifles!

Civilization was crashing with a prolonged roar of falling laws and institutions and customs echoing across the world. The ordinary methods of transportation and production having completely broken down days before, the stream of food into the great cities had abruptly ceased. The brutal throngs that filled those cities subsisted by looting the existing food supplies for a time, but soon these were exhausted and then terrible battles took place between the rioters for food which they had found. Battles they were of hordes of ragged brutes, of savages, who fought with knives or with their bare hands in the streets. Only occasionally was a shot heard, for almost none there was now with sufficient dull glimmer of intelligence to manipulate a gun.

In the shadow of the tall towers of New York, and in the brick and stone acres of London and the boulevards of Paris, thousands and hundreds of thousands of these savages swarmed, the ways choked with corpses of the slain. At night they crouched fearfully in hallways and offices and corridors, the vast cities lying dark and silent beneath the stars. Shapes of prowling animals were being seen in some of them by night. No wheel turned in all the world now, for none seemed left with intelligence enough to operate the simplest machine.

And these swarms that had been human were changing in appearance too. The men were unshaven and hairier, it seemed. Much clothing had been discarded, crude belts that held knives or the like weapons being retained. They crouched now as they walked, their step a watchful, animal-like one. From under shaggy brows they stared at each other. Small, crude family-groups held together, the man battling other men for the possession of food. Some managed to kill animals, and wore the skins.

They were troglodytes, millions of them, men such as the world had seen thousands of years before, as humanity had been then. They were troglodytes, wandering through the cities and towns that they themselves had built, staring in wondering fear about them at things the purpose of which they could not understand. But most had no wonder, only a brutal lack of interest in all save food and mating and sleep. There were no fires, for all had lost the use of fire and feared it now.

Driven by hunger, great masses of them were pouring out of the cities into the countryside, to hunt roots and herbs and to kill small animals for food. They made rude shelters for a time, then abandoned them for caves and crannies in the rocks. They ceased to use knives or spears, they could but throw great stones at each other or wield chance clubs, or fight with bare hands.

Many had remained in the cities and among them was more fighting. With each day they were changing farther, it seemed, going farther back along the long road of change that man had ascended so slowly through the ages, and that he was slipping back upon so swiftly.

The streets of New York and Glasgow and Constantinople and Yokohama saw them, these animal-like, ape-like hordes that wandered there. Ape-like they were becoming, indeed, swiftly hairier of body, more crouching of gait, stooping occasionally in moving to run on hands and feet. Clothing they had discarded. The fragmentary, mumbled speech that they had kept until days before had given way to a meaningless medley of barking shouts and cries whose tone conveyed their crude attempt at communication. They roamed the great cities in little groups or tribes, of each of which one was the strongest, the tyrant, the acknowledged lord.

And now, they were changing still. Were running more on hands and feet, walking upright less. Back from man to troglodyte, and from troglodyte to ape had the human races gone, and now were slipping back still into the animal races from which the apes had come! World atavism—and it was wiping the last human-like forms from the face of earth!

OF this great change that in days swept man back into the brutal forms of dead ages, I, Allan Harker, was a witness from the first. For it was at New York that

the early manifestations of the change had been first noticed, in that increasing wave of terrible crime that was in days to rage over the whole earth.

Neither Ferson nor I, of course, had any suspicion of the thing's real magnitude in those first days. We followed, with the same astonishment that held most in the world, the astounding growth of crime and violence, but it was remote from our own interests, and we were both very much absorbed in our differing work of experimentation. We spent more time on that work, indeed, in those days than before, for both Ferson and I seemed to have lost a little of our usual skill and knowledge. I know that he caught himself in inexplicable lapses, and I know that I, usually the most patient of biologists, forgot myself in sudden impatient rage on one or two occasions and smashed retorts and test-tubes about me. Neither of us dreamed, of course, that we were being affected by the same strange forces that were releasing humanity's passions in a carnival of crime.

But when a little later the great wave of crime that was making earth hideous was made more terrible by the innumerable inexplicable accidents that were occurring, Ferson became thoughtful. He deserted his own white-tiled laboratories for the university's psychological test-rooms with their strange recording instruments, and spent hours there carrying out intricate tests of the reactions of himself and others. It was after two days of such tests, when the fatal accidents occurring everywhere were taking toll of thousands of lives daily, and when almost all industrial activity was slowing and stopping because of them, that Ferson came back, his countenance as I had never seen it.

"I've found it, Allan," he said quietly. "The cause of all this terror—these innumerable crimes and accidents and riotings."

"The cause of them?" I repeated, uncomprehendingly, and he nodded.

"Yes, and that cause is world atavism! An atavism, a throwback, of all the world's animal life, that is beginning with man as the most recently developed animal and that is taking place before our eyes! Taking place in ourselves even!"

"World atavism!" I gasped. "But, Ferson—that such a thing could be—it's inconceivable!"

He shook his head. "Not inconceivable. You remember Grant and his theory, that the evolution vibrations from the sun were what had pushed earth's life up the road of evolution? And you remember that Grant said that were those evolution vibrations to cease to reach earth from the sun, all earth's life would slip swiftly back upon that road?"

"I remember," I said, "but how could such a thing happen? What could ever halt the play of the sun's evolution vibrations on earth?"

Ferson's eyes were somber. "I do not know what could," he said slowly, "but I think I know who could!"

"Ferson!" I cried. "You don't for an instant think that Grant——"

"I do think so," he said, his voice steelly. "Grant discovered the existence of the evolution vibrations—he alone of men knew all concerning them. Do you remember what he said when they refused to let him explain his theory even at that meeting? He said: 'I will give you proof of this. I will give you proof yet of this theory, and such a proof as the world has never seen before!"

My mind was reeling. "Then you think that when Grant disappeared—that he——"

"I think that that great proof that Grant promised in his rage to give the world is the world atavism that is upon humanity now! I think that Grant in some inconceivable way has used his knowledge and his power to deflect or dampen the evolution vibrations coming toward earth from the sun, and that it is because of the absence of those vibrations that earth's life is slipping backward!"

"But where will it stop?" I exclaimed.

"It will not stop, Harker—this tremendous change has only begun. Man, the most recently evolved of all animals, is changing first, and will go back through troglodyte and ape to the forms before them, back through changing beast-forms. By then the other animals of earth will be changing also, thrown back along the evolutionary road, and that great atavism will continue until earth's life has all changed back into the first crude protoplasmic forms from which eons ago it sprung!"

"But what can we do?" I cried. "There must be some way of stopping this!"

"There is only one way," he said. "Grant is causing this great world atavism, is shutting off the sun's evolution vibrations from earth by projecting toward the sun, no doubt, a great dampening or neutralizing vibration that stifles them, annihilates them, at their source. We must find Grant's whereabouts, must destroy whatever apparatus he is using to do that!"

"Yet if all are changing—we two also must be changing!" I exclaimed, and he nodded.

"We two are already a little affected as all men are, more or less. Our lapses of memory, the difficulties we have in our work now, these things in the last days are the result of this world atavism in us, just as the crimes and accidents filling earth are. And we two must protect ourselves against this tremendous change, whatever we do, for on us depends the one chance of halting Grant's terrible work. The world will never believe that that dread work is really going on until it is too late, so you and I must not change!"

Ferson went swiftly on to explain his idea. This was none other than to construct two small projectors that would each automatically and ceaselessly generate artificial evolution vibrations, vibrations affecting a limited range as the sun's vibrations had affected all earth. These projectors in their compact cases could be worn on our bodies by each of us without being noticeable, and would keep each of us always thus in the range of the vital vibrations, so that we would not be affected by the world-wide absence of that which was causing this world atavism. Whatever great dampening wave Grant was sending out toward the sun to neutralize its evolution vibrations would not, of course, affect the vibrations of our own little projectors.

The next two days saw us at work upon these projectors. The method of producing the evolution vibrations we knew, for as I have mentioned, they had been artificially produced in a small way by physicists upon Grant's first announcement of his theory. The second day, therefore, saw our projectors complete, small flat black cases that were strapped to our belts without being noticeable, each holding the tiny but marvelously powerful batteries that were the current-source, and the compact little generator that automatically and unendingly released the vital evolution vibrations for a range of several feet. With these completed and working, and secured thus by them from being ourselves affected by the terrible atavism that was upon the races of man, we began our greater work of locating Grant and the appa-

ratus by which he was shutting off the sun's vibrations and loosing this horror on the earth.

For horror it had now become, and the world was waking up to its true nature as every sort of brutal passion was released in terrible crime over it, and as the inexplicable mindlessness of men brought on terrific accidents. Already a dozen of the greatest governments in coöperation had called a conference of earth's greatest scientists at New York to explain or to halt at least the horror that was sweeping earth. To that conference they came with each a different and more incredible explanation of the thing, and to it went Ferson and I to give them the true explanation and to turn them toward the search for Grant that might yet save humanity. But that explanation was never given, for Ferson's first mention of world atavism was greeted with incredulous cries, and when he went on to mention Grant, such a derisive storm arose, that he was forced bodily from the meeting, leaving the scientists disputing fiercely over the most impossible of theories, supporting and opposing those theories by blows.

For they, like the rest of humanity, seemed incapable now of clear and sustained thought upon any subject. Even Ferson and I, working day and night in the isolated upper Manhattan laboratories of the university, were able to see clearly what was happening about us. We were living, eating, sleeping at the laboratories by this time, for all means of transportation and all industrial activities were ceasing. Great masses of men roamed the streets of the city, some forming into gangs that made life terrible for the others, the rest engaged in indiscriminate looting. The great London riot and the abortive outbreak in lower New York had now taken place, and it was evident to all that the last shadow of law and order in the city was vanishing, for more and more the troops and police who maintained it were engaging in the rioting themselves.

News came still a little, in incoherently written and erratically printed sheets, for a few days, and it was thus we learned of the huge Chicago riot and subsequent fire. It marked the beginning of the end. Within a few days more utter lawlessness reigned over New York, corpses lay in its streets and looters were everywhere. The university buildings, deserted now by all but ourselves, were not attacked except on a few occasions by the looting swarms, there being no food or other desirable things in them, and Ferson and I had rifles and pistols in our laboratory to repel the ragged and brutal gangs that might attack us.

In those terrible days we were occupied heart and soul in the work of locating Grant and whatever mechanism it was by which he was casting this doom on humanity. It was Ferson's idea that the great damping wave, which Grant must be sending toward the sun to halt the play of its endless evolution vibrations, would affect certain recording instruments, if the correct frequency for their circuits could be found. Once that was found, by observing the amount by which the instruments were affected at different locations by the waves of the great damping vibration, we could calculate and chart that great wave's source with some degree of accuracy. It seemed to me a very slender chance, yet I knew as well as did Ferson that it was the one possible way. Grant, we knew, would have protected himself, as we had, by a small artificial projector of the vibrations.

So in those fearful days we worked with the recording instruments, watching them at each new trial for some indication of the force whose source we sought. The whole great mass of New York's giant structures that stretched southward and downward from our laboratory lay now in complete darkness each night; the last wonted activities of civilization having ceased in it as elsewhere. Ragged hordes of savages roamed it, savages so hairy and crouching and brutal of face, seeming each day more prognathous of jaw and slanting of brow and animal-like of eye, that we knew them to be troglodytes, cave-men, men such as humanity had been ages before and such as it was over all earth now.

We saw them occasionally prowling through the university grounds in search of food, shambling toward us with lowering brows to attack us when they glimpsed us, but fleeing in fear when we fired over their heads. For none of them could manipulate so complicated a thing as a firearm. All earth's hundreds of millions were prowling their way in just such brutal bands, thrown back to the state that had been man's before history's dawn. And ever more brutal and hairy and animal-like they were becoming as they slipped back farther still, back from troglodyte to ape! Mankind was gone, transformed into these still-changing brutes—all except Ferson and me.

I CANNOT tell now in full of those terrible last days of change, those days in which in our chance glimpses we saw men making that other terrible step backward, from troglodyte to ape. For Ferson and I were working with the speed of utter despair. Even were Grant's terrible work to be halted, the sun's evolution vibrations again released on earth, it would take them untold ages to raise the brute-like beings about us to the status of men once more. Humanity was passing, had passed, into the brute around us, yet for their sake, for the sake of the humanity that might rise again in the dim future, we kept to our efforts, sought still to halt this awful change, that would otherwise not stop until protoplasmic slime alone was left living on earth.

We had found the correct frequency for the circuits of our recording instruments, and in feverish haste set up those instruments at intervals of a mile, working through the night. The weirdest of work it was, the vast city's streets and structures silent in the night around us, the countless hordes of brute-like beings that once had built them now cowering in the buildings in ape-like fear of the night's mysteries. We took our readings, hastened back to our laboratory, and dawn found us marking those readings on the great chart-map of the section we had ready. Somewhere in that section, somewhere near New York, we knew, Grant lurked with his terrible mechanism, our first readings having shown us that. And now, as with trembling hands Ferson and I drew the graphs on the big chart, we stared for a moment after in complete silence.

Those lines converged at a point in a midtown block of the great city south of us, a block occupied by a single gigantic building whose aspiring tower was in sight of our laboratory's windows!

For moments Ferson and I stared from chart to tower in silence, and then without words we had turned, seen to the filled magazines of the pistols at our belts, and were passing out of the laboratory into the bright sunlight. As silent as ever, we started southward.

Never, were my existence extended a thousand years, could there be blotted from my memory that journey southward through the silent towers of New York that Ferson and I made then. For the great city that lay

silent about us beneath the brilliant noon sunshine, was a city of horror unutterable. Dead lay thick in its streets and great dogs, already strange and fierce and wolflike, ran in packs among them. The rusting wrecks of smashed automobiles were piled at every corner. No window of all we passed remained intact, sidewalks and streets were sprinkled with shivered glass. Westward across the river a great fire was burning in the cities there, pouring a black volume of flame-laced smoke up to the skies. But more terrible than all of these things were the hordes, the swarms of creatures that moved through the streets and ways about us, the countless creatures that once had been the city's people!

Great ape-like creatures they were, not apes such as men had known, but ape-like races such as men had sprung from eons before. In groups and packs of scores they roamed the city's ways. Covered with thick hair, stooped and crouching of gait, the garments that they had worn as men torn and discarded, there was in them no semblance to humanity. They walked stiffly toward each other, stooping to rest hairy forearms on the ground each few steps. They growled and barked in rage, or chattered volubly and meaninglessly. The majority were prowling in wrecked stores for fragments of food. Others moved along the streets in a search for small animals, for insects even.

Growling in rage their groups came toward Ferson and me as we moved onward, but each time a pistol-shot sent them fleeing from us. We moved on, never speaking, Ferson's face icy calm, my own brain reeling. We came at last to the base of the giant building that we knew must hold whatever mechanism Grant was using to withhold the evolution vibrations from the earth.

Ferson turned to speak to me for the first time. "Somewhere in here," he whispered. "We must search, Harker ——to find Grant's apparatus——"

"And if he is with it?" I asked, but his only answer was to tighten his grip on the pistol in his hand.

We passed into the great building's marble entrance hall, a place of dim shadows, through which we stumbled over prostrate dead. We went quickly through the looted, wrecked rooms that had been the luxurious shops of its first level. Then the stairs, and we were going upward, level after level, searching through the immense building's numberless offices and rooms. In one or two were dead, and some had been wrecked, but in none, in no part of the building, it seemed, were any of the ape-like throngs. That seemed encouraging, somehow, and with beating hearts we pressed on upward.

Level after level. We were high in the immense building; its floors here were smaller of extent because of its pyramidal form. Yet there was no sound from the shadows about us, no sign of what we sought. Despair was growing in us, for we were high in the great tower that was the building's uppermost part, and had found nothing. Through the shadowy halls we pressed still, and through the silent rooms lit with the gold of the westward-swinging sun. But as we moved up the narrow stair toward the last and highest level of the great tower, something flamed in Ferson's eyes as in mine.

A sound had come from above to our ears, a steady, slow clicking as of a great clock. Pistols in hand, we moved up, found ourselves in a small hall at the tower's side. The unused elevator-shaft was beside us, and the stairs that led to the roof. But before us was the single door that gave access, apparently, to the whole space of the tower's uppermost level. And from behind it came the slow clicking to our ears!

As one we crossed the hall toward that door. Ferson's hand on its knob turned slowly, and slowly, astoundingly, the door swung open. Our pistols lowered for the moment in our amazement, we stepped through, stopped. A dozen feet before us stood Grant, a heavy automatic in his hand trained upon us.

Silence. In it Grant's eyes held ours. His dark-browed powerful face was lit with unholy triumph, with sardonic exultation. I saw that before us was the whole space of the tower's highest level, thrown into one great room. Huge black-cased and powerful batteries were ranged upon each other in scores at one side of the room. Armored cables led from them through incalculable generators and transformers to a great object at the big room's center. It was like a giant searchlight, a dozen feet or more in diameter, swung in a frame resembling gimbals, so that it could be turned in any direction. The twelve-foot disk inside it glowed silently with white light, and the great thing was turned to face exactly the sinking sun westward. It was slowly following the descending sun, turning slowly under the action of a great clock-mechanism, whose clicking was loud in our ears still.

Grant, Ferson and I——we were silent there in the room, all motionless, until Grant spoke. His voice was metallic, controlled, mocking.

"Ferson and Harker," he was saying. "Ferson and Harker, who believed in my theory, my power, it seems, when none else on earth did. Who made projectors like the one that I wear, and have escaped the world doom that I have released. Have escaped and have come in search of me, with pistols in their hands, even!"

My brain was racing. I knew that to lift the arms in our grasp meant instant death. Grant's sardonic mirth lashed suddenly out in scorn.

"To come through the city toward this building firing shots!" he mocked. "Shots that made those brute-swarms beneath us flee, but that warned me at the same time of your coming! To steal clumsily in upon me that way, thinking to surprise me and halt the work that's not yet finished!"

"That work has gone on too long, Grant," said Ferson slowly, his voice strange. "It cannot go on longer."

"Cannot?" came the bitter voice. "You mistake, Ferson—it must and shall. What are they now but brutes, animals; the world of men that derided and refused my work, that might have transformed them into gods? Brutes, and even more brutal shall they become, going down through form after form to the first protoplasm. They asked for proof——I have given the world proof, have thrown back humanity eons on the road of progress! And I will throw them and all earth's life back farther still! This great projector——it is worth the months it took to build it—months that I toiled here and posed as a scientist studying electrical phenomena, working to finish the projector at last and turn its great damping vibration toward the sun in a mighty ray! A vibration tuned to neutralize and destroy that part of the sun's evolution vibrations radiating toward earth! You have lost, Ferson——Harker, for you both die this moment and this projector shall continue to withhold the evolution vibrations from earth until its life has been thrown back in this world atavism into the primal protoplasm! Until I alone am left living upon——"

His pistol roared, for it was at that instant that Ferson

leaped. But even the bullet could not halt Ferson's rush, so swift and unexpected was it, and he struck Grant, knocked him back, I leaped toward the projector.

Grant's pistol was detonating even as he was knocked back, though, and half-way to the machine something seemed to strike me two swift, smashing blows beneath the shoulder. I swayed, staggered on to the projector, was beneath it and reaching toward the cables leading into it. Grant was springing toward me, his pistol at my head. But behind him Ferson, blood on his lips and on his breast, half-raised himself, the pistol in his hand speaking. At its crack Grant swayed, collapsed and fell, the black compact case at his belt, that had preserved him, breaking loose as he struck the floor.

Ferson, leaning, had his dimming eyes upon me, striving to speak. I reached, grasped the cables, tore at them once, twice, and then they had ripped loose. The white light of the disk inside the great projector vanished, and the mechanism that moved it ceased its clicking. The world atavism, that had thrown the races of man back to the state that had been theirs eons before, was ended at last! Ferson, his eyes on mine, seemed to smile feebly in approval. Then his body slipped quietly down and he lay as motionless and silent as Grant.

Afterword

I HAVE been writing here in this silent room for a time, whose length I cannot guess. Westward, though, the sun is touching the horizon, its level rays searching through this room, over the great projector and over Ferson and Grant, lying silent before me.

My life is ebbing swiftly from me with each passing minute, yet with the age-old instinct of man strong in me I have striven thus to leave a record of the great change, that men of the future in some far day may read.

Men of the future! For there will be such, there must be such. The upward surge of evolutionary progress that has been interrupted, set back, here on earth begins again its slow upward climb with the halting of this projector, the coming again of the evolution vibrations that are now playing on earth again. Beneath me, in the silent city, there swarm the ape-like hordes that were once humanity, but through the coming ages they will climb up again through troglodyte and savage barbarian to man!

And it is for those men of the far future that I have written with my last strength these words, as a record and a warning that I shall enclose in the steel box beside me.

A warning that their civilization be never cast back from man to brute as ours has been. And if God send that they heed that warning, none among them ever shall die as I die now, the last man of all men, looking down through the sunset into the familiar but infinitely strange city, where roam the hordes that once were men. Sunset! Sunset for our civilization, our races, as for the earth. But, dying, I know that after their passing there must come with the slow upward climb of evolution new races, new civilizations, as surely as after sunset and night must come the——

THE END

What Do You Know?

READERS of AMAZING STORIES have frequently commented upon the fact that there is more actual knowledge to be gained through reading its pages than from many a text-book. Moreover, most of the stories are written in a popular vein, making it possible for anyone to grasp important facts.

The questions which we give below are all answered on the pages as listed at the end of the questions. Please see if you can answer the questions without looking for the answer, and see how well you check up on your general knowledge of science.

1. What is the distinguishing feature of the Millikan ray? (See page 391.)
2. What is the essential requirement for celestial bodies to be capable of conjunction? (See page 393.)
3. What star is called the brightest jewel in the diadem of the firmament? (See page 398.)
4. What pump exceeds a mercury vapor pump in producing a vacuum, and where is it described? (See page 399.)
5. What furnace can produce intense heat by induction in the metal to be heated? (See page 405.)
6. What is the metal beryllium? (See page 416.)
7. What explorers' names are identified with Antarctic exploration? (See page 417.)
8. What are the names of the principal geographical areas and features of the Antarctic? (See page 425.)
9. What suggestion might be given for guiding a tractor or other car along a snow covered road? (See page 424.)
10. What form of life do evolutionists claim as the first or basic one? (See page 430.)
11. Can the sun's radiations give a theoretical cause for evolution? Why? (See page 430.)
12. What is sadism? (See page 431.)
13. If an infection spread from a point in all directions at 17 miles a day, how long would it take to encompass the earth? (See page 447.)
14. Describe Dr. Alexis Carrel's great work with living tissue. (See page 452.)
15. Who discovered argon, and how was he led to do it? (See page 453.)
16. What were the steps in the work? (See page 453.)

The Last

Sequel to:
"The Red Peril"

¶"Quick!" cried the leader of the rescue party. "Miss Hunter! Captain Hamilton! Mister Williams! Into these boxes at once!"

War

By

Capt. S. P. Meek, U. S. A.

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UNTIL a sufficient number of gas masks had been manufactured during the latter part of the World War, numberless combatants and non-combatants were incapacitated and made life-long invalids by the introduction of the life-destroying gases which some all too clever chemists had supplied. Also there was a great amount of wholesale injury to vast areas of land and even to life—all of which made for the eventual surrender of the erstwhile conquering nation. But of all the amazing weapons and methods of warfare devised and used before the completion of that famous war, nothing can compare with the possibilities that already loom in the horizon for the next war. And Capt. Meek, himself an Army man, with an obviously versatile knowledge of science and a lively imagination, gives us some excellent ideas in the form of a fascinating tale of scientific fiction—in fact, one of Capt. Meek's best.

Illustrated by MOREY

GRADUALLY the hum of the huge Nashky generators, which were sending a protective field of pure force unassociated with matter over the island of St. Helena, died down to a mere murmur of sound and then was silent. From far overhead a siren wailed and two transport aerostats dropped slowly and gracefully toward the little landing field which had been built for them when the allied nations of the world had chosen St. Helena as a place of exile for the defeated rulers of the now defunct Russian Union of Soviet Republics. For ten long years the captives had remained on the island, which had been isolated and rendered unapproachable by the rest of the world, by the utilization of the very forces by which Nashky, one of the Council of Seven which had ruled Russia, had almost imposed the rule of his group on the world. During this period but two of the captives had left the island.

One of them was Feodor Balinsky, the greatest living serumologist and physiological chemist and at one time the arch-enemy of mankind. Balinsky had been captured with the rest of the Russian leaders and had narrowly escaped execution for his share in the gigantic crimes which Russia had perpetrated. Before his trial, however, he was examined at the request of Ilga Vestoff by Doctor Von Helmer, the great Swiss surgeon. Von Helmer has unhesitatingly pronounced Balinsky as suffering from dementia caused by a blood clot in his brain and curable by operative measures. He operated successfully and Feodor Balinsky, overtaken by remorse, had meditated suicide. The influence of Ilga Vestoff had prevented him from doing so and had turned his mighty genius back into the paths it had trodden before his mind became affected and from his island prison had come a dozen serums of almost inestimable value to the medical profession in their age-old fight against disease. The fact that Ilga Vestoff, who stood in the eyes of the world for all that was noble and courageous, had married Balinsky and shared his exile, had turned the tide in his favor and the results of his work had done the balance. After seven years of imprisonment, he was released and had since risen to high honors as a result of the labors of himself and his assistants in the huge research laboratory established for him at Pole Mountain, Wyoming.

The other to leave was Nashky himself. Ivan Nashky had been the victim of no disease and the fact that Nashky generators were used to guard St. Helena was no evidence of active co-operation on his part. The man proved to have a colossal brain and not even the genius of General Hamilton was able to unravel from the mazes of data dragged from it under the influence of hypnotic anesthesia, the secrets underlying his invention. Faced with the alternative of execution for his crimes or building enough of his generators to render St. Helena impregnable against attack, Nashky had capitulated and had built them and had taught American engineers the methods of their operation, but no one save himself understood their construction. They had proven wonderfully efficient and had needed no repairs since their erection.

Nashky had not used all of the tools and materials furnished him in fabricating the twelve generators, as the world soon learned. Scarcely had they been in operation for a month before, one evening, a guard saw a small rectangular block of dark substance rising from the ground in the vicinity of the shops where Nashky had done his work. The guard had given an alarm and the batteries installed on the island had poured a rain of radite shells toward the strange aircraft, but without result. An immediate check of the prisoners was made and it was found that Ivan Nashky had made good his escape. The aerial patrols of the entire world had been at once notified on the general broadcast wavelength,

but from the moment that his ship had disappeared in the rapidly darkening sky, no trace of either him or his craft had ever been obtained.

He had done good work on his generators before his escape and it was soon found that he had constructed the minimum number that would serve to fully safeguard the island of exile. General Hamilton, Chief Signal Officer of the United States, had spent many hours in measuring the output of the machines and had finally rendered an opinion that, were one of them to be put out of operation and disassembled for study, the island would be imperfectly guarded. Despite his report, an attempt was made to cut one of them out of the circuit but it was found that Nashky had done his work so cleverly that any attempt to disconnect one machine made it impossible to start the balance. The world was therefore forced to forego the mechanical advantage which the knowledge of their construction would entail and allow them to remain where their inventor had set them up, running continuously day and night, except for the one hour a month when they were shut down in order to allow supplies to be landed for the use of the prisoners and of the garrison.

Slowly the two transport aerostats dropped to the ground and a detail came from the warehouses to unload them. Hardly had the crews debarked from the ships before the dull boom of an alarm gun sounded on the still air.

The Commandant in his office located in the main lookout tower pressed the button of his communicator and spoke sharply into it.

"A strange aircraft right above us, sir, at about sixty thousand and descending rapidly," reported the sentry.

"Damn it, man, warn them off!" shouted the Commandant. "No ships are allowed closer than two hundred miles while the generators are shut down."

"I did warn them on the general wavelength," replied the sentry, "but they are still approaching."

The Commandant took a pair of binoculars from the drawer of his desk and stepped to the window. He was an old grizzled man with the single stars of a Brigadier General on his shoulders and the front of his blouse blazed with bits of colored ribbon, prominent among which was the sombre black edged with crimson which marked him as a veteran of the terrible war with Russia a decade before. He raised the glasses to his eyes and stared and his face paled momentarily.

"Judas Priest!" he murmured.

For a moment he was frozen into immobility but a lifetime of training to meet emergencies came to his rescue and he dashed to his communicator, knocking over a chair which stood in the way.

"Man all batteries!" he shouted. "Align the guns on that approaching craft as soon as it is within range but don't fire until I give the word. Start the generators at once!"

THE island became a scene of bustle and hurry. Grim-faced artillerymen broke open caissons and with electric loaders sent home huge sixteen and eighteen-inch radite shells into the hungry maws of the antiaircraft rifles while the observers and gun pointers in the battery-command stations trained the huge guns on the oncoming craft now barely thirty thousand feet above them. Gun after gun was served and battery commander after battery commander reported his piece in readiness for firing and aligned on the target.

The Commandant was again at the window staring at the approaching craft. As it came nearer he could see, emblazoned on the hull, the sombre colors of the insignia of the long defunct Russian Union of Soviet Republics.

"Nashky!" he muttered to himself. "Why the devil didn't they install a Hamilton generator or two here? These guns will be of no use if he has the same type of craft as he escaped in!"

With a final glance at the stranger he moved to his desk and locked in the button of his communicator.

"All batteries, fire!" he cried.

With a roar that shook the ground the batteries turned loose their three and five thousand pound projectiles. The aim of many of them was perfect and the stranger disappeared in a smother of smoke and flame from the bursting radite shells. Gradually the smoke was dissipated and the craft could be seen moving slowly but steadily toward the island.

"Keep up the fire!" cried the Commandant. "What is the matter with those generators?"

The roar of heavy guns shook the lookout tower but the welcome hum of Nashky generators did not make itself heard.

"Why the devil don't you start those generators?" stormed the Commandant into his communicator.

"They won't start, sir," came a report at last. "There is some kind of an interference wave that throws them out of phase every time we try to get them into synchronism."

The Commandant swore and hastened back to his window. The stranger was only about three thousand feet above the island now and was slowly maneuvering about, gradually getting into the position he wanted. Presently a puff of smoke came from the hull above. With a gasp, the Commandant watched the nearest battery. The shell fired from Nashky's craft was a small one but the havoc it wrought was frightful. It fell within a hundred feet of one of the eighteen-inch rifles which were firing and the huge tube suddenly wilted and fell forward as though it were tallow before a fire. The Commandant rubbed his eyes and looked again.

"What happened to that gun?" he cried.

There was no answer to his question and he trained his glass on the rifle. There was no doubt that it had drooped forward as though it were made of lead and even as he watched, the barbette carriage crumpled into a shapeless mass and all that was left of the glittering steel was a huge amorphous mass spreading slowly over the ground. Scattered here and there on the ground were shapeless splotches of color which had been the gun crew a few moments before.

Again the gun spoke from Nashky's ship and another rifle near the first began to wilt down while the crew collapsed as though smitten with lightning. A voice speaking English with a decided accent sounded from the Commandant's communicator.

"Good evening, General," it said. "I presume that by now you are aware who I am. In case you are more than usually dull this evening, I will tell you that I am the Admiral of the air fleet of the World Union of Soviet Republics. I trust that you are enjoying watching the effects of solvite, my latest contribution to the science of warfare. Since you may have missed some of the finer points of the demonstration, I will now fire again and demolish a few more of the rifles which you have kept so many men busy polishing for the last ten years.

You will observe in a few shots, the advantages of this new explosive over the radite with which you are familiar. I beg you to keep close watch for I am about to fire again."

The antiaircraft batteries which had been silent for a few moments resumed their ground-shaking thunder but through the sound locater which he had trained on Nashky's craft, the Commandant could hear the bark of the small rifle with which it was armed. He looked toward the batteries and watched another huge rifle suffer the fate which had overtaken the first two and saw the crew collapse into immobility as the effects of the explosion reached them. Again Nashky fired and another gun and its crew went out of commission. Huge radite shells were bursting continuously around the attacking ship but it suffered no harm from them.

"Cease firing!" shouted the Commandant into his communicator. "All crews leave their guns and take refuge in gasproof casements. Keep trying to start those generators!"

"You have shown real wisdom in your orders, General," came Nashky's mocking voice. "Unfortunately, gasproof casements will not in the least protect your personnel any more than firing at me will protect your material. However, I am not in the least interested in wiping out the garrison of St. Helena—at least, not at this time. The real objects of my trip are two. One is to rescue the prisoners whom you hold here, who are men whom I know and trust and whom I can depend on. The other is to compass the destruction of the generators which I was forced to construct and install during the period of my enforced sojourn as your guest. I presume that I am safe in assuming that you are surrendering without terms?"

"We will never surrender!" stormed the Commandant.

"How sad," cried Nashky in a mocking voice. "I regret that you force me to take extreme measures toward your unfortunate garrison. I believe, if my memory serves me right, that the gasproof casement for Battery Vestoff is close behind the west gun. I will now drop a solvite shell into it."

The gun of Nashky's ship spoke again and to his horror the Commandant saw the heavy concrete of the gasproof casement sag and fall inward in a shapeless mass. It was evident without further inquiry that none of the gun crew could have survived the shot.

"Is the demonstration sufficient or shall I fire again?" inquired Nashky. "I have several thousand shells on board and I will gladly spend a couple of dozen in wiping out your garrison if such extreme measures are needed to convince you of the futility of further resistance."

The Commandant hung his head and groaned aloud in anguish.

"Don't take it so hard, General," went on Nashky. "Remember that better men than you have surrendered to me in the past. Believe me, I speak truly when I tell you that immediate and unconditional surrender is the only means you have of sparing your command a peculiarly unpleasant death. I don't wish to rush your decision and so I will give you thirty seconds in which to decide before I start firing again."

The Commandant groaned again.

"What are your terms?" he asked sadly.

"That's better, General. They are very simple. All of the prisoners whom you hold are to be at once released and conducted to the two transport aerostats on your landing field and allowed to embark. They will be furnished with arms and the regular engineering crews of the transports will man the ships, but they will be unarmed. As soon as the embarkation is complete, your men will be allowed to gather in the vicinity of the landing field and remain in the open. They will not be harmed but I will destroy your antiaircraft rifles and your Nashky generators before the transports take the air. The temptation to fire on them might be greater than some of your gunners could withstand and I do not care to have any of my countrymen lose their lives. Since you will no longer have prisoners, you will no longer have any use for the generators and frankly, I don't care to have Hamilton start pawing them over and pulling them apart."

"I will give up the prisoners to you since I have to, but I will not deliver any of the crews of the transports to your mercy," cried the Commandant.

"As you will, General. You have heard my terms, which admit of no deviation. Either they are accepted at once or I shall start firing, and if I start, I will not cease until I have completed the destruction of every member of the garrison."

"I will accept your terms," muttered the Commandant.

"I congratulate you on your judgment, General. One other slight thing. I require your word of honor that the terms of the surrender will be strictly and honorably observed and I will expect you to personally inspect the transport crews and assure yourself that they are unarmed."

"I give you my word of honor," replied the Commandant.

"That is satisfactory, General. I will hover over the field until you inform me that the terms of the surrender have been carried out and that the transports are ready to rise and that your garrison are gathered at the landing field. Please caution all of your men not to go near the areas where my shells have landed, as their effect is singularly permanent."

GENERAL Hunter left his office with a bowed head and stepped into the conveyor that stood without and was whisked away to the dormitory where the Russian prisoners were quartered. His Chief of Staff met him on the way and the Commandant explained the situation in a few words.

"There is no use in sacrificing everyone, Van Nuys," he said. "The devil has the whip hand over us and all that we can do is to dance to the tune he whistles."

"You will be court-martialed, sir!" exclaimed the Chief of Staff.

"Possibly I will, Van Nuys, but even so, I would rather be cashiered with a clear conscience than to know that my pig-headed obstinacy had meant the death of my entire command. Tell Wilson to release the prisoners and arm them. Have the engineering crews of the transports mustered before me on the landing field."

Colonel Van Nuys saluted and hastened away and General Hunter turned his conveyer toward the landing field. As he reached it and stepped out of the car, a man approached and saluted.

"Sir, may I speak to you?" he asked.

"What is it, Captain Hamilton?" asked the Commandant. "I know that you couldn't start your generators."

"There was a powerful interference wave that threw them out of phase, sir, or Nashky could never have

landed a shell on the island. It didn't interfere with my communicator though and I heard all that passed between you and him. I have a favor to ask of you, sir."

"What is it?"

"The Chief Engineer of the *Chico* did not come on this trip and it is one man short in the crew. I am a competent engineer and I would like your permission to go in her as the missing Chief Engineer. I can disguise myself so that no one will know me and I may be able to do some good."

"They will probably kill you, Hamilton."

"I'll take that chance, sir. My brother won a tilt with Nashky ten years ago and I would like to try the Hamilton luck against him again."

"Your brother? Are you related to General Robert Hamilton, the inventor of the Hamilton generator?"

"Yes, sir, he is my brother. He was a Major when he trimmed Nashky's wings and he was made a General on the strength of it. Promotion is darned slow nowadays and I'd like to try my luck."

"If you are General Hamilton's brother I can see nothing to do but to let you have your way, Captain. Go ahead and get into a uniform and hurry, for the transport crews will be mustered here in a few minutes. No weapons, mind, I have given my word on that."

"I will be unarmed, General. Thank you very much, sir," replied the Captain as he hurried away.

A tramping of feet was heard and the Russian prisoners arrived, guarded by a detachment of the garrison. The Officer of the Day stepped up to the General and reported the prisoners as all present, including one who had been brought from the infirmary on a stretcher.

"Have they been armed, Lieutenant?" asked General Hunter.

"Not yet, sir. I have arms for them here but I waited for your personal confirmation of Colonel Van Nuys' orders before issuing them out."

"Arm them," said the Commandant tersely.

The Officer of the Day saluted and issued orders to his guard. In a few moments the prisoners were armed and were marching toward the transports to board them. One of the prisoners stopped behind for a moment to speak to the Commandant. As he approached, the General looked up and recognized Zaneff, the ex-Premier of Russia.

"What is it, Zaneff?" he asked wearily.

"General Hunter, for some time I have known that this day was coming and I am greatly relieved to find that you have come through it unharmed. For ten years you have been my jailer and your kindness and courtesy have been unfailing under the most trying circumstances. I wish to thank you, both for myself and for my fellow-prisoners for the many favors you have done for us and to extend to you our hearty wishes that the Court of Inquiry which will sit on the matter will completely exonerate you. We will be very glad to prepare a statement if it would help your case any."

Tears showed in General Hunter's eyes.

"Thank you, Zaneff," he said simply. "There is nothing that you can do for me in the matter. Your testimony would only be a repetition of what I will say myself and I believe that my word will not be doubted. Thank you and convey my thanks to your comrades for their thoughtfulness. Good-bye."

Zaneff wrung the General heartily by the hand and hastened toward the waiting *Chico*. Colonel Van Nuys stepped up and reported that the engineering crews of the *Chico* and the *Kenowis* had been mustered. As General Hunter turned to inspect them, the Chief of Staff leaned forward and spoke earnestly into his ear.

"General," he muttered, "there is something funny going on. One of the crew of the *Chico*——"

"Yes, I know, Colonel," interrupted the Commandant. "It is by my authority and with my permission."

Colonel Van Nuys saluted and stepped back and General Hunter carefully inspected the assembled engineers and confiscated a pistol, the only arm he found. At his order, the crews repaired to their respective ships and boarded them and secured the doors.

"Colonel Van Nuys, order the entire garrison and all civilians to assemble here at the landing field. Everyone is to come, for Nashky will bombard the island as soon as all have assembled."

Half an hour later General Hunter stepped to the communicator in the warehouse office and informed Nashky that the terms of surrender had been complied with.

"Very well, General," replied Nashky. "What will follow during the next half hour will be a sight that is new to the world. Because I wish to have it accurately reported by trained observers, I will ask that you, Colonel Van Nuys and Captain Hamilton, your Engineering Officer, go to the lookout tower and observe it. You will not be harmed. Notify me when you have arrived."

General Hunter paled slightly but he stepped out and summoned Colonel Van Nuys and a Captain of Artillery who bore a slight resemblance in personal appearance to the missing Hamilton and with them proceeded to the lookout tower. As he informed Nashky of his whereabouts, the huge craft above him started to move.

Nashky had been right when he said that the sight would be unique. From the hull of the Russian craft a small gun spoke from time to time and each time a shell fell in the vicinity of one of the guarding antiaircraft rifles of the island and each time the gun melted as though it were tallow before a fire and both gun and carriage spread out over the ground in a huge shapeless mass. When the guns had been disposed of, Nashky turned his attention to the huge generators which had guarded the island far more effectively than the guns had. There were twelve of the generators and twelve shells were fired and the machine lost form and became huge black and gold stains on the ground. When the destruction of the defenses was complete, Nashky spoke again.

"My mission has been accomplished, General, and I will take my fellow-countrymen away from your care. Kindly report to the military and naval heads of the world what you have witnessed, without exaggeration and without suppressing any of the details. I would advise you to stay away from the vicinity of the spots where the shells landed if you value your life. Before I leave your vicinity, I will make one more stipulation. You will not use your general wavelength communicators nor attempt to give any other form of alarm for the space of three hours after my departure, nor allow it to be done. Will you promise this?"

"I will promise nothing more," stormed the Commandant.

"Your failure to promise will result in the destruction of all buildings on the island, for I am not sure of the location of all of the communicators. This will leave your sick without a hospital and all of you without food or means of asking for aid for some time and would ac-

complish nothing in the end, for I would have more than the three hours of start which I am stipulating. I will give you one minute in which to make up your mind."

"You have the whip hand today, Nashky," cried the Commandant. "I will promise, for I have no choice. I will live for only one thing; the day when I see you hanged higher than Haman."

"When that day arrives, General, I will cordially invite you to be present," said Nashky with a laugh. "If you will now look out of your window, you will be able to wave a last farewell to your prisoners before they leave."

General Hunter glanced at his watch as the *Chico* and the *Kenowis* rose from the landing field. The little fleet of vessels moved off to the northeast at an elevation of twelve thousand feet, the huge Russian craft rising far above them until it was out of sight, even to his field glasses.

"What time is it?" he demanded sharply.

"Two hours and forty-two minutes before we can give an alarm, sir," replied Colonel Van Nuys. "You had better lie down for a few minutes, General, you look fagged. I'll see that you are at the communicator ready to send out an alarm as soon as the time limit has expired."

"HERE they come!" cried Colonel Van Nuys.

General Hunter stepped to the window and looked up. A hundred tiny scouting aerostats spotted the sky in all directions, serving as a screen for the fleet of heavier craft which formed the first line of defense for the oncoming fleet. The cruisers swung over the island and took up position, grim and stationary, surrounding the flagship from whose peak streamed the colors of the Chief of Staff of the United States. It was an inspiring sight and one which thrilled the old warrior to the bottom of his heart. He straightened up for a moment, his hand at the salute, but a cloud passed over his brow and he seemed to slump suddenly.

"They make a wonderful show, don't they, General?" said Colonel Van Nuys.

"Show? Yes, they do," replied the General bitterly, "but that is all they are—a show—a vain show. Nashky could destroy them all in an hour with his one ship and do it without danger to himself. There goes the communicator. Tell them to drop to the center of the landing field. I'll go to meet them."

Directed by Colonel Van Nuys, the flagship of the American fleet dropped gracefully to a landing and General Munroe, Chief of Staff of the United States, stepped out and acknowledged the salute of General Hunter.

"Hello, Hunter," he said cheerfully as he stepped forward and shook hands with the Commandant. "So your birds have flown, have they?"

Without answering, General Hunter unhooked his sabre and handed it to General Munroe. The Chief of Staff took it with an air of surprise.

"What's this, Hunter?" he asked as he examined the weapon closely. "Has this some bearing on the escape?"

"It is my sabre, sir," replied General Hunter. "I have failed in my command and I am tendering it voluntarily rather than have you ask me for it."

General Munroe turned on his subordinate sharply.

"Don't be an ass, Hunter," he said. "When I want your sabre, I'll ask for it and not before. Buck up, man," he went on kindly, "no one blames you for the escape. I know your record well enough to stake my commission that you did all that human ingenuity could do to foil it. No one can fight that devil Nashky. Come along, we'll go up to the lookout tower and see what happened. Tell us about it as we go. You know Hamilton, don't you, Hunter?"

The Commandant shook hands with the famous inventor of the Hamilton generator which had been instrumental in bringing about the downfall of Nashky and his cohorts a decade earlier.

"Did Nashky take any one with him except the prisoners?" asked General Munroe as the party made their way toward the lookout tower.

"He took the engineering crews of both the *Chico* and the *Kenowis* with him as prisoners. In addition, unknown to himself, he took along Captain Hamilton, my Engineering Officer, who disguised himself as the Chief Engineer of the *Chico* and went along unsuspected."

"My brother?" asked General Hamilton.

"Yes, sir. I had not known of the relationship before but he told me when he asked to go, in order to 'win a tilt against Nashky,' as he put it."

"Charley is a clever boy," replied General Hamilton. "He may be able to do some good. At any rate, he can only die and if so, he'll die in a good cause."

"He took no other prisoners?" asked General Munroe.

"No, sir."

"I beg your pardon, General," interrupted Colonel Van Nuys. "There was one other whom you are neglecting to mention."

"What do you mean, Van Nuys? The ones whom I have named are the only ones that I know of."

"Your daughter, sir."

"Jane? What do you mean, man? Are you crazy?"

"No, sir. I tried to tell you at the time that one of the *Chico* crew was not what he seemed and you told me that it was by your authority and with your permission."

"I meant Captain Hamilton, idiot!"

"I was not aware that he was going. The one I was referring to was your daughter, who slipped into the *Chico* in the dress of an oiler before the prisoners embarked."

"Van Nuys, are you sure of what you are saying?"

"I am positive, sir. Steady, General!"

General Hunter had swayed momentarily but he recovered himself and with a face as expressionless as a block of granite, he led the way to the lookout tower.

"What the devil?" cried General Munroe as he looked out from the tower and saw the shapeless blobs which had been antiaircraft rifles at the time of his last visit. "Hamilton, what do you make of it?"

General Hamilton surveyed the scene thoughtfully through a pair of field glasses for several minutes before he spoke and when he did, it was in the form of a question to General Hunter.

"What did Nashky call the stuff he used?" he asked.

"Solvite."

"The name is suggestive, to say the least. It looks as though some powerful solvent had been poured over those guns and generators. With your permission, General, I am going down to those guns and take a look-see."

"Nashky warned me to keep away from the spots where the shells landed," said General Hunter.

"All the same, this has to be investigated. I'm going down there."

"No, you're not, Hamilton," said General Munroe sharply. "We can't afford to risk you. No one will go

there for the present. I'll send for the Chief of the Chemical Warfare Service and have him bring a crew equipped for gas work and let them do the exploring. They are experts at it and you and I are not. Get busy on the communicator and find out whether any trace has been reported of the *Chico* or the *Kenowis*."

General Hamilton stepped to the communicator but there was no information forthcoming. So far as could be told from reports from aerial patrols and commercial liners all over the world, the fleet commandeered by Nashky had dropped out of sight. No one had seen any such craft, but in view of the fact that the air lines were as well mapped out as the ocean routes had been a half century earlier, this was not surprising. All that Nashky had to do was to go between the regular traffic lanes and he could have kept out of sight for months.

"Well, there seems to be nothing more that we can do here," said General Munroe when he had heard the report. "The President is calling a conference of the military heads of the nations which allied to fight Russia before, at Honolulu, and we might as well get along in that direction. Hunter, let Van Nuys take command here and you come with us. Your description of the attack will be vital. Van Nuys, when General Gilmore gets here, turn everything over to him and cooperate in every way possible. He will have a crew equipped for gas work and he will examine the places where the shells fell and take samples. In the meanwhile, let no one approach them. Come gentlemen, let us start."

THE flagship rose from the landing field and headed toward Honolulu, closely flanked on each side by four huge aerostats which carried on their upper decks long tubes projecting forward and back, to each side and directly upward, while from the pierced bottoms of the hulls, other of the sinister tubes projected. General Munroe looked at them and sighed.

"I wish that we had a thousand of those generator carriers," he said to General Hamilton. "They are the only ships in the fleet that are worth anything when it comes to attacking Nashky in the kind of a craft that he has. There is one good thing about the matter, though, Nashky's ship is not equipped for much offensive work aside from bomb dropping."

"His old ones were not," replied Hamilton, "but no offense other than bomb dropping was needed at that time. I rather expect that his present ship will surprise us by its offensive power. Remember those rifles on St. Helena?"

"So far as gun fire goes, I am not afraid of a hundred of his craft," replied Munroe. "We can certainly outfight him and hold him up long enough to get one of your generators bearing on his craft and that is the end of the battle."

"I hope so."

"What are you talking about, Hamilton? It took you less than ten minutes to down four of them ten years ago."

"That is true, General, but remember that the Hamilton generator was as big a surprise to Nashky as the Nashky aircraft was to us. Now he is forewarned and I have no doubt that he has prepared a defense against them. It is nine years since he escaped and no one knows what a brain of the power of his may not have evolved during that period."

"You are unduly pessimistic, Hamilton. I will admit that Nashky is a genius, but there are limits to his power. Even he cannot do the impossible. At any rate, I would like nothing better than to have his ship show up right now."

The Communications Officer of the flagship hastened up and saluted.

"A scout has reported the presence of a strange craft of unknown design and flying no colors straight ahead, sir," he reported. "It is at an altitude of about thirty thousand feet and is descending rapidly and heading toward the fleet. The scout requests instructions."

General Munroe hastened to the signal room of the flagship and received in person a confirmation of the scout's report. Before the excited Lieutenant could give the details of the appearance of the stranger, other buttons in the signal room began to glow and a dozen other scouts were repeating the information. A cruiser was ordered forward to investigate.

The commander of the cruiser was a veteran of the last war with Russia and as soon as he arrived within sight of the strange craft, he reported it as being of the same type as those which Nashky had launched against the world a decade before.

"Now I am converted to a belief in Santa Claus," cried General Munroe as he slapped General Hamilton on the back. "What could be sweeter? The old fox has run his head into a steel trap this time. He must think that we have no Hamilton generators with us."

"I am not so sure of that," replied Hamilton dubiously.

"Oh, quit your croaking. Just wait and see the fun. This scrap will be over before it is well started."

He turned to the Communications Officer.

"Order all scouts to attack at close range. They won't do any good, but they'll keep him busy while the generator carriers slip up on him. As soon as the scouts attack, the cruisers will approach and go into action with smoke-shell to hide the approach of the generator carriers. This ship will take elevation to thirty thousand and watch the fun."

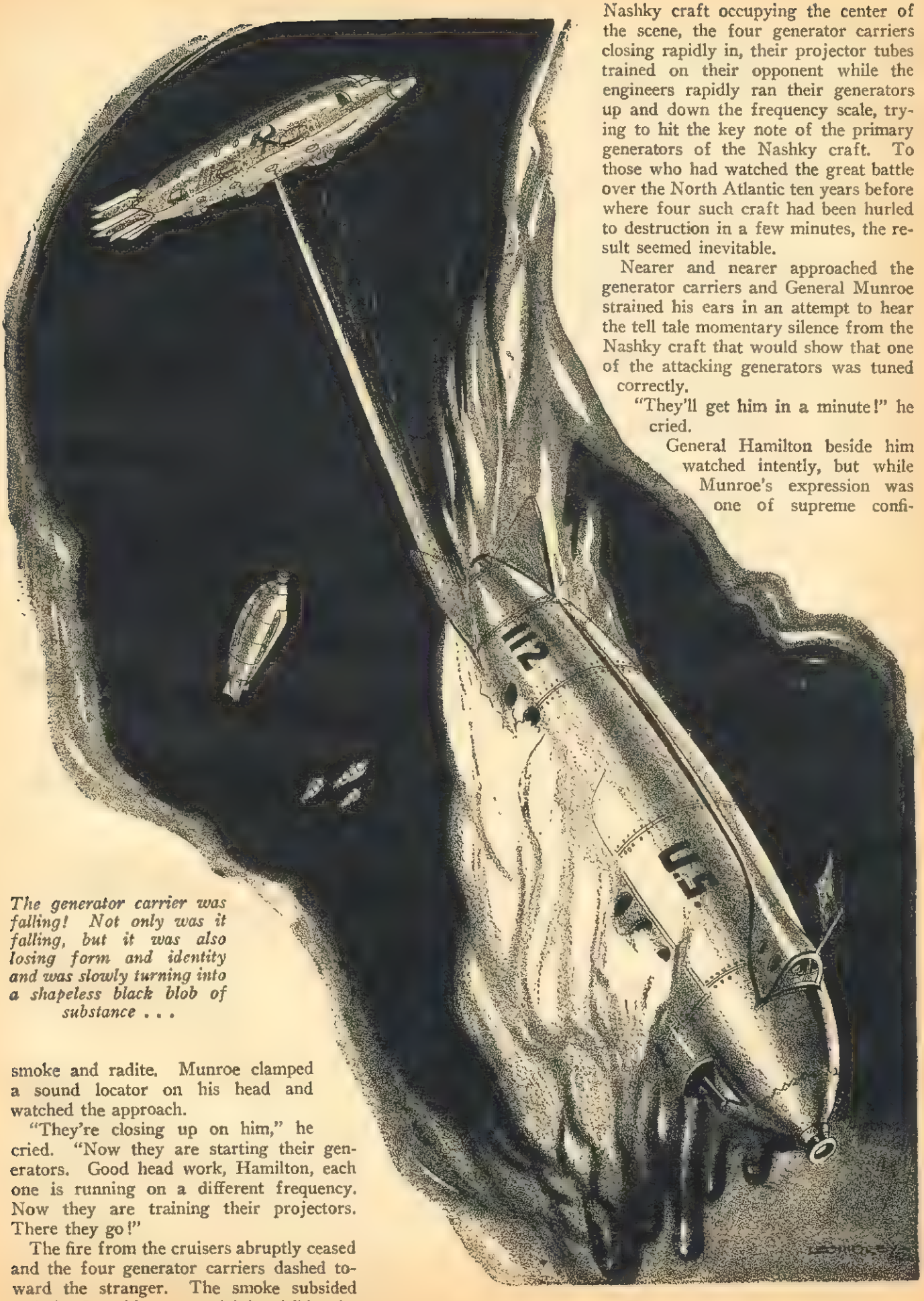
The flagship rose above the balance of the fleet and hovered at an elevation of six miles. Two miles lower the cruisers swung into battle formation and headed west. The flagship followed, above and slightly behind the main fleet. Presently a dark spot made its appearance ahead. As the fleet advanced, the spot was resolved into a craft even larger than the flagship surrounded by a cloud of what looked like tiny insects. The little scouts darted in and out, weaving continuously and keeping up a hail of machine gun bullets and thirty-seven millimeter radite shells toward the larger mass, but it ignored its attackers as a whale would have ignored the attack of a school of minnows.

"That is a Nashky ship, all right," exclaimed Munroe. "Six propellers and no elevating fans. Wait until the cruisers get into action and then you'll see some fun."

Even as he spoke the cruiser column arrived within range and swinging sharply to the left, began to pour broadsides of six- and eight-inch shells toward their quarry. In a moment Nashky's ship was hidden from view in a smother of smoke and flaming radite and the scouts, their mission accomplished, drew off and left the battle to the heavier craft.

"He can't see through that haze," exulted Munroe. "Look, Hamilton, there go the generator carriers. Now watch her come tumbling down!"

Two of the huge generator carriers moved off to each side of the Nashky ship and stole toward the cloud of



The generator carrier was falling! Not only was it falling, but it was also losing form and identity and was slowly turning into a shapeless black blob of substance . . .

smoke and radite. Munroe clamped a sound locator on his head and watched the approach.

"They're closing up on him," he cried. "Now they are starting their generators. Good head work, Hamilton, each one is running on a different frequency. Now they are training their projectors. There they go!"

The fire from the cruisers abruptly ceased and the four generator carriers dashed toward the stranger. The smoke subsided and the five ships were plainly visible, the Nashky craft occupying the center of the scene, the four generator carriers closing rapidly in, their projector tubes trained on their opponent while the engineers rapidly ran their generators up and down the frequency scale, trying to hit the key note of the primary generators of the Nashky craft. To those who had watched the great battle over the North Atlantic ten years before where four such craft had been hurled to destruction in a few minutes, the result seemed inevitable.

Nearer and nearer approached the generator carriers and General Munroe strained his ears in an attempt to hear the tell tale momentary silence from the Nashky craft that would show that one of the attacking generators was tuned correctly.

"They'll get him in a minute!" he cried.

General Hamilton beside him watched intently, but while Munroe's expression was one of supreme confi-

dence, Hamilton's brow was distinctly clouded with worry. The attacking ships approached until only a thousand yards separated them from their quarry before any signs of offensive action came from the giant Nashky. Suddenly a puff of smoke came from the hull of the sombre craft and a small shell was seen to burst against the tough armor plate skin of the leading generator carrier.

"He'll have to use heavier metal than that if he hopes to do any damage," exulted General Munroe.

General Hamilton made no reply but the lines of worry in his face grew deeper.

"Good God!" he exclaimed, "Munroe, do you see that?"

"It can't be true!" cried the Chief of Staff.

He rubbed his eyes and looked again. *The generator carrier was falling!* Not only was it falling, but it was also losing form and identity and was slowly turning into a shapeless black blob of substance which was gradually assuming a spherical shape as it plunged toward the sea below. General Hamilton leaped to the communicator.

"All ships fire!" he shouted. "Smoke if you have it, or radite or anything handy, but fire! Blind him before he can fire again!"

A bustle of activity arose in the cruisers, but Hamilton's orders had come too late. Before a shell was fired by the American fleet, the gun on the Nashky had fired three more times and the American fleet's generator carriers were wrecked. Down into the Atlantic they plunged to destruction.

THE cruisers were firing now and the Russian ship was hidden from view in a cloud of smoke and flaming radite, but it was no longer passive. Forward through the cloud it relentlessly pressed. As it came momentarily out of the smoke, a gun spoke from it again and the American fleet was left to mourn one of its finest cruisers. Not daunted by the fate of their comrades, the American cruisers attacked with fury, but time and again, the single gun of the Nashky sent forth a message of death and destruction and ship after ship lost form and plunged, an amorphous mass, into the hungry sea below.

With a dozen of his finest cruisers and all of his generator carriers gone, there was but one thing left for General Munroe to do and he did it. He ordered a general retreat. In orderly lines, the American fleet drew sullenly off and then the real supremacy of the Nashky ship became evident. Forward it charged at a speed greater than could be attained by any but the fastest scouts of the Americans. No longer was it firing only one gun. From a dozen portholes came puffs of smoke and the gunnery was deadly in its accuracy. Ship after ship took the last fatal plunge into oblivion. The Americans tried to fly; they broke up into a dozen detachments, but the relentless fire of the Nashky followed them and it was not until the last of the cruisers which made up the backbone of the finest air fleet in the world had been destroyed that the firing ceased. Aside from a few scouts which were splitting the air at maximum speed away from the scene of the conflict, the air was clear except for the flagship and the ominous Nashky. The black craft rose and approached the flagship and the Navigating Officer looked toward General Munroe for orders.

"Stay where you are," he said bitterly. "There is no use in trying to run or to fight. Let's take our medicine like men."

Nearer and nearer came the ominous craft until the emblem of the long dead Russian Union of Soviet Republics could be plainly seen on its hull. The button on the flagship's communicator began to glow and the Communications Officer switched his receiver to an audiator in order that all could hear. A smooth oily voice, speaking English with a noticeable accent, filled the cabin.

"Good afternoon, General Munroe," it said. "Ah, yes, there is my old friend, General Hamilton. How do you do, Hamilton? And how are you, General Hunter? I haven't seen you for some time. All of my old friends seem to be assembled here to greet me. I am sorry to think that Van Hornung didn't live to see this day. He would have enjoyed watching the most one-sided aerial engagement ever fought. It was too bad that your generators couldn't get on my primary wavelength, Hamilton, but alas, science makes discoveries and the world progresses. I am afraid that you will have to class your epoch-making discovery as obsolete. Have any of you gentlemen anything to say to me?"

"Yes, Ivan Nashky, I have," replied General Munroe.

"Admiral Nashky, *if* you please, General."

"Admiral Nashky, then, damn your impudence, I have something to say to you. You have defeated one of our fleets with your damnable inventions, but there are a dozen more fleets left and we have men who are just as good scientists as you are. You may triumph for a while, but you are doomed in the end. Now go ahead and fire on us and don't taunt us any longer in our helplessness."

"My dear General, I have no intention of firing on you. I would not think of injuring my old friends—yet. Your testimony before the conference which will assemble in Honolulu is exactly what I need to let the world realize just how helpless it is before me. I merely gave you a lesson in the power of my latest craft. Besides, I wish you to carry a message from me to the council."

"Why don't you give it direct?" interposed General Hamilton.

"Because, my dear Hamilton, it tickles my fancy to think that the Chief of Staff of the United States is reduced to the position of my messenger boy."

"What are your terms?" asked General Munroe.

"My terms, General, are simplicity itself. I will accept no surrender of any kind. I trust no one, least of all, the Russian people who turned on me in my adversity. The race of men has gone to seed and it is my intention to destroy all human life on the planet with the exception of my own and the few friends from St. Helena and elsewhere who have assembled under my protection. This is the message which I wish you to take to the world.

"You have already seen, in a small way, the effects of solvite, 'B.' This substance comes in two allotropic modifications, one of which has a purely local effect and which does not attack the atmosphere except in the immediate vicinity of a burst. I have another and more powerful form, solvite 'A' which I intend to use shortly. This modification will not only affect solids as you have seen solvite 'B' do, but it also affects the atmosphere in such a way as to make it transmit the disintegrating effect of the burst to anything with which it comes in contact. Its action, furthermore, while not affected by wind, is progressive and extensive. Were I to fire one shell loaded with it now, in two years not a living being,

except those whom I chose to protect, would remain alive. My plan, however, is to fire one or more shells a day in various parts of the world and enjoy the amusing spectacle of mankind flying from place to place with the spectre of death stalking always behind them, and knowing that their flight is, after all, useless, and will lead them but to the grave."

"The man is crazy!" ejaculated General Munroe.

"Possibly I am, General, but if so, realize that I am a madman equipped with such power as the world has never known and that I have made no threats which I am not in a position to carry out. Carry then, this message to the world, that Ivan Nashky has weighed mankind in the balance and found them wanting and that the word of their doom has been spoken. Now, good day. I am returning to my base in order to prepare for the slaughter which will start tomorrow."

The sombre black craft rose in the air until it was a mere speck in the powerful telescopes with which the flagship was equipped and then headed south at a greater rate of speed than the maximum of the flagship. When it had disappeared, General Munroe gave the word and the flagship resumed her interrupted trip toward Honolulu.

A MONTH had passed since Ivan Nashky had hurled his insane threat of destruction to the world. A month of horror and death. A month of vain striving to combat the horrible plague which had been launched. A month of hopeless fighting and of heroism unparalleled. Ivan Nashky had made good his threat. Apparently human life was doomed.

The council of the nations had met in gloom. General Gilmore and his crew had visited St. Helena and had tried vainly to secure samples of material from the wrecked guns. The most efficient gas protection which had been developed proved to be worthless and man after man of the crew died as they risked and gave their lives in the attempts. It was not even possible to recover the bodies. When daring men tried with long poles to hook the bodies out, the deadly infection ran up the handles of the poles, rendering them soft as putty and in several cases, where the men had not been able to drop the poles and retreat in time, they too were caught and disintegrated into shapeless masses before the horrified gaze of their comrades.

Nor did this sad news alone account for the gloom which pervaded the discussions. Nashky had not waited long before putting his threats into operation. The afternoon of the first day of the council meeting, his ship appeared over London. Ships of the British Royal Air Force had sallied forth to do battle but were hurled to the ground, one by one, in ruins. Three generator carriers had been among the attackers but their fate was no different from that of the other ships. When the defenders had been cleared from the air, a bomb was dropped on London and the black craft departed.

Television reproduced the scenes of horror in London all over the world and the other cities saw huge buildings topple and subside into shapeless masses of matter while people dropped like flies and disintegrated where they fell. At first the destruction was purely local and centered about the point where the bomb had landed but it was soon observed to be spreading. Brave men sallied close to the scene of the catastrophe and measured the rate of spread. It proved to be about twelve hundred and fifty yards per hour, about seventeen miles a day. As it would take nearly two years for the infection to cover the world at that rate and as it was almost certain that the virulence of the attack would decrease as the area grew larger, a momentary sense of relief was felt. It seemed certain that long before two years could pass, some means of combating the contagion would be found. The best scientists of the world were hurried off to London to observe the phenomena. They were unable to go directly above the infected area for it soon became evident that the infection was spreading in a hemispherical wave from the point of origin.

By the time the rate of progression and related data had been obtained, the black craft had appeared over Rome and, ruthlessly destroying all aircraft which attacked it, had dropped another bomb and departed. Fresh gloom spread over the world and as the days went by, a feeling of utter hopelessness and despondency spread almost as rapidly as did the effects of the solvite. The black herald of death appeared from time to time and dropped a single bomb and departed. Nor could any man tell when the communicator buttons would glow and Nashky's taunting voice announce a new point of attack and prophesy fresh horrors for suffering humanity.

Every attempt to combat the black ship had been unsuccessful and every effort to determine the cause of the mysterious disintegration of matter under the influence of solvite had been equally futile. There was no starting point from which to work and the time came when the heads of such governments as were still functioning ordered their flyers to cease from vain attacks and useless sacrifice of men and ships and to keep their aerostats in readiness to transport the population away from the various points of attack. For a time this method prevented much loss of life but as the number of areas devoid of life and incapable of supporting it increased, people became huddled together in the remaining safe areas where they starved and sickened and died from disease like flies; pressed closer and closer together each day by the encroaching areas of death and not knowing at what moment Nashky's ship would appear in the heavens above and drop a bomb into the middle of the narrowing strip of ground where they were huddled.

All of Europe and Australia and most of Asia and the Americas had already been desolated while communications from Africa had ceased and the air lanes were closed by the mounting solvite. The government of the United States, in common with those of the rest of the world had ceased to function and the only semblance of control over the actions of the people left alive was exercised by a little group of scientists assembled at Pole Mountain, Wyoming, based upon the Serumology Laboratory presided over by Feodor Balinsky. For some unknown reason, possibly a spark of feeling for the man who had so vitally aided him in his previous attempt to conquer the world, Nashky had in his raids, avoided the vicinity of Pole Mountain. Again, it may have been a feeling of hatred for his old comrade in arms which led him to spare him to the last and thus prolong his torture. Whatever the cause, the fact existed and there, in the heart of the Wyoming country, were gathered together the greatest brains of the age and from there emanated the few messages to which the remnant of mankind paid heed and from there intrepid adventurers sallied forth and gave their lives uselessly in trying out new methods which they hoped would combat the plague.

Such was the situation when General Hamilton, who was naturally one of the little group there assembled, received the message which spelled hope of continued life, and which might, if they could get more time, even spell the ruin of Nashky's terrible plan.

THE *Chico* rose from the landing field at St. Helena and soared to a height of twelve thousand feet before the navigator gave the orders which started the propellers and drove the ship toward the east at her maximum cruising speed of six hundred miles an hour. Captain Hamilton, in his assumed rôle of Chief Engineer, strode through the hull watching the small atomic engines which drove both the propellers and the elevating fans. The crew of the *Chico* knew their business and he found nothing to criticize for a few minutes. Presently he noticed one of the oilers oiling a commutator bearing and he hastened over.

"Keep oil out of that commutator!" he snapped. "Do you want to wreck us?"

The oiler turned away with a mumbled word but Hamilton grasped him by the shoulder.

"What do you mean by such conduct?" he demanded. "You knew better than to oil there and you know enough to stand at attention and look at an officer when spoken to. Look at me!"

He whirled the oiler sharply around. The man hung his head, but the Captain twisted sharply on his shoulder and with a grimace of pain the oiler looked up. Hamilton released his grasp and stepped back.

"Good God!" he muttered in an undertone, "Jane Hunter!"

The Commandant's daughter glanced swiftly around.

"Don't give me away, Charley," she whispered hastily. "I am not ready to have my identity disclosed yet."

"How on earth did you get aboard?" he asked wonderingly. "Your father inspected the crews before we embarked. Did he know that you were coming?"

"No, he didn't. I wasn't among the crews that were inspected. I heard Nashky's orders to father and I stole an oiler's uniform and slipped into the *Chico* before the Russians boarded it. Colonel Van Nuys saw me and I was afraid that he would tell father, but apparently he didn't. I had no idea that you were coming along and I stowed away in the hope that I would be able to get some information about their plans that might help."

"You fool!" cried Captain Hamilton under his breath. "You shouldn't have trusted your head in this lion's den. They will show you no mercy. This is no place for a woman!"

"If Ilga Vestoff had argued that way ten years ago we would have been dead or slaves to Nashky today," she replied. "I may be of some help to you, for I fancy that your mission is the same as mine."

"Keep out of sight as much as possible," muttered Hamilton. "Go forward to the storeroom and stay there until I send for you."

Jane Hunter straightened up and saluted as a Russian appeared in the doorway and hastened forward as Hamilton had directed.

Hour after hour the *Chico* drove on her way. Captain Hamilton had no access to the charts but an occasional glance at the tachometer and repeater compass on the engine room wall gave him the data on which to base a rough idea of the course. They were evidently avoiding all of the regular traffic lanes and were cutting northeast across Africa toward the great unknown regions in the heart of Asia. Hoping to learn something of their destination, he entered the control room and spoke to the Russian who was navigating the ship.

"How long will we be aloft, sir?" he asked,

The Russian looked at him coldly.

"Why do you wish to know?" he demanded.

"Our fuel supply is not overabundant and we are not running at our most economical speed. If we have a very long trip before us, it would be better to reduce speed a couple of hundred miles an hour."

"How many hours' supply of fuel have you at this speed?"

"About twelve hours without touching the emergency tanks."

"And using them?"

"Five hours additional for the elevating fans alone. One hour and a half for the fans and the propellers at this speed."

"That will be sufficient."

"Over twelve hours, but less than thirteen and a half at six hundred miles an hour," he reflected. "Just about where I thought; the middle of the Gobi desert. Well, he couldn't have chosen a better hiding place."

Hour after hour the transports forged ahead. The regular fuel supply ran low and under Hamilton's directions the emergency tanks were cut in. A half hour later the engine room communicator button glowed and an order came from the control room to reduce to quarter speed. Hamilton glanced out of a forward porthole and a hundred miles ahead saw an atomic searchlight blink and throw a beam straight up for an instant and then vanish.

"A blinking beacon," he said to himself. "There is no traffic lane or landing around here so it must mark our destination."

His surmise was correct and forty-five minutes later the transport was landed and a guard of Russians appeared at the door of the engine room and ordered the crew to follow them. As they stepped out on the ground, Hamilton paused in amazement at the sight that met his gaze. They had landed in a range of mountains which Hamilton later decided were the Alashans, but at the time he had no eyes for them. Standing alone in the rugged scenery was a huge dome of silvery material fully nine hundred yards in diameter and a hundred and twenty yards high. There was no sign of windows in the dome but from the crest projected the end of an optical instrument of some sort and on the ground level were huge panels with smaller ones inset in them after the manner of sliding doors.

Another detachment of men moved up and Hamilton glanced around and saw that the *Kenowis* had landed beside them and that it was the crew of the sister transport who had joined them. The strange black craft which had wrought the destruction at St. Helena stood near by and Hamilton marveled at the huge proportions of it. As he watched, the large panels of the dome moved silently back and he saw that they were indeed doors. The black craft was raised a few inches from the ground and a number of men came from the interior of the dome and started to tow it inside. A glance showed him that they were Mongolians of the nomad tribes which inhabited the Gobi.

Before his startled gaze the *Chico* and the *Kenowis* moved and rose a few inches in the air, although the elevation fans were motionless. He glanced down and saw that each transport had been landed on a sheet of

silvery material which resembled the walls of the dome. Other crews started to tow the two ships toward the great dome. He watched the performance for a moment but a sharp command from the leader of the Russians started the prisoners toward the doorway of the dome. Inside, Hamilton found that the entrance did not lead into the dome itself but into a huge compartment made of the same material as the dome and that a door similar to the one through which he had made his way confronted him. The outer door slid shut and the inner one opened and the prisoners marched through it into the brilliantly lighted interior.

The dome had been erected over a huge stone building, fortress-like in its appearance. Surrounding the main building were numerous skin tents of the common Mongolian type and Hamilton surmised that they were the dwellings of the Mongolians he had seen. The prisoners were marched into the stone building and to a large central room where, enthroned on a dais, sat Ivan Nashky. The Russian stared at them in silence for a few minutes before he spoke.

"I have declared war on the world," he said abruptly. "I have only a few followers and many of them are savages; excellent fighting men in their crude way, but not readily adaptable. I can use a few good engineers. If you care to enlist in my service to fight against your countrymen, you may have the status of slaves. If you do not, you will be killed. What is your choice?"

FOR a moment there was silence, broken by the Chief Engineer of the *Kenowis*.

"Your fate might be made easier when you are finally defeated if you held us as hostages," he suggested. "Of course, none of us will join you on any terms."

"My final defeat?" laughed Nashky. "It may interest you to know that I have just returned from destroying the Eastern battle fleet of the United States which was commanded by no less a person than General Munroe himself. Only one ship escaped destruction and I spared it deliberately. You have chosen your fate, sir, let the others speak for themselves."

Captain Hamilton stepped forward.

"I will throw in my lot with you gladly," he said.

"And so will I," said Jane as she stepped to his side.

"And I," added an engineer from the *Kenowis'* crew.

"Are there any others?" demanded Nashky.

The Chief Engineer of the *Kenowis* stepped forward and spat deliberately in Captain Hamilton's face.

"That is my answer to your treachery," he snarled. "I choose death!"

Without a word, Hamilton launched his fist toward the face of his assailant. The blow hit full on the chin and the Chief Engineer staggered and went down. As he did so, Hamilton leaped forward and kicked him brutally in the side.

"Take that as pay for the dog's life you led me while I served under you," he shouted. "And that, and that!" He delivered other kicks at the prostrate figure.

Nashky smiled approvingly.

"Well done," he chuckled. "You are a man of the true faith. Are there any others?"

There was no reply and Nashky nodded toward a group of Mongolians who stood beside his dais, apparently as guards. They stepped forward and seized the luckless crew and marched them forth. Nashky turned his attention to the group of three who remained.

"You are content to remain as slaves?" he asked.

"On any terms that give me a chance to strike a blow at the tyrants who have so long oppressed me," replied Hamilton.

Jane and the engineer from the *Kenowis* nodded assent.

"Good!" exclaimed Nashky rubbing his hands. "You will be accepted on that status, but if your performance is equal to your talk, you may be raised from that rank and become freemen and my comrades in arms. Take them to a cell for the present."

Another group of guards stepped forward and led the three to a small cell set in the recesses of the outer wall of the building. As the door crashed shut behind them, the engineer of the *Kenowis* turned to Hamilton.

"That was well done, Captain Hamilton," he said. "Poor old Owens, it almost broke his heart to think that a Chief Engineer would be a traitor."

"Who the devil are you?" demanded Hamilton.

"Williams, United States Secret Service," replied the engineer with a grin. "My errand is the same as yours. Who is your partner?"

Hamilton shook hands warmly with the Secret Service Operative.

"This is Miss Jane Hunter, General Hunter's daughter," he said. "She stowed away on board in the hope of becoming a second Ilga Vestoff."

"She won't have much chance if her sex is discovered," replied Williams as he shook hands with Jane. "Nashky is a more cold-blooded fish than Balinsky was. Now, Captain, what are your plans?"

"None until we see how the land lies. The only thing that we can do is to seem to enter heartily into Nashky's plans and hope that we can learn something worth communicating and find a chance of doing it. I have been on watch for fourteen hours, so the first thing I need is sleep. If you'll pardon me, I'll turn in for a little while before they come to put us to work."

He threw himself down on one of the three cots with which the cell was provided and almost instantly dropped off to sleep. His companions soon followed his example and quiet reigned in the little cell.

CAPTAIN HAMILTON swung Jane Hunter behind him and fired his heavy automatic three times at the oncoming Mongolians. At short range, the heavy radite-charged bullets from the weapon penetrated three or four men before losing their energy and the slaughter inflicted by the three shots momentarily halted the advance.

"This way, Charley," cried Williams.

Hamilton fired twice more and then turned and ran in the direction which Williams had indicated, being careful to keep his body between Jane and the Mongolians. Apparently they were not armed with pistols or rifles for not a shot was fired at them, but as they retreated the advance of their enemies was resumed.

Around a corner they dashed and found Williams standing before an open panel in the wall.

"This way!" he cried and they followed him in. Before the leading Mongolians had rounded the corner, the panel slid noiselessly shut and the fugitives were in darkness.

"Take my hand," directed Williams.

They followed him silently through a long stretch of darkness. Presently he paused.

"There is a panel in the wall here that leads into a large room with a staircase on the far side. We will

follow that up to the roof of the building and there we will find a lookout tower surmounting the rest of the building. It is fairly roomy, yet small enough to defend easily. I managed to smuggle enough supplies into it to last the three of us for several months. Now to see whether the way is clear."

He drew a pocket X-ray torch from his pocket and pressed a button, directing the beam on the wall before him. A spot on the wall slowly grew misty and then disappeared. Through the hole thus created the three gazed. The room before them was empty.

"All right," exclaimed Williams. "I am going to open the panel. Be ready to make a dash for the stairs."

The panel slid open and the three raced across the room and up the stairs that opened before them. They were halfway up when a shout came from the room below. Hamilton glanced back and saw a dozen Mongolians led by a Russian streaming through a doorway into the room below. He raised his pistol and fired rapidly.

"Come on, Charley!" cried Williams from the stairs above him. "Don't waste time in shooting. They won't dare to fire toward the dome."

The top of the stairs was blocked by a massive door but Williams swung it open and shut it behind Hamilton in time to block the way of their pursuers. Across the roof they raced and into the lookout tower. A Russian blocked their way but a shot from Williams' pistol disposed of the last obstacle and they entered the tower and bolted its massive door behind them just as the foremost of their pursuers burst open the door leading to the roof and poured forth in pursuit.

"Hold them off for a minute with your pistol, Charley," cried Williams as the door clanged shut. "There's a machine gun on the other wall that I'll have in a minute."

Hamilton fired rapidly and accurately but more of the Mongolians appeared momentarily in the doorway and the leaders of the rush had almost reached the door of the tower when a crackle of machine-gun fire came from his side and the attacking wave withered and crumpled, the Mongolians dropping like flies before the deadly rain of radite-charged bullets. For a moment the roof was deserted.

"Miss Hunter, can you fire a machine gun? Good! Take charge of this one. Those loopholes have synchronized stroboscopes attached which we'll rig up as soon as I can find the trigger motors and synchronizing gears. You two hold back the rush while I try to use this communicator and get in touch with Washington, or what's left of it."

He adjusted the communicator to the general wavelength and sent out call after call with no response. After a few attempts he gave it up and returned to the others.

"Nashky has an interference wave at work," he reported, "and I couldn't get through. I have vital news too, news that would help a lot if I could get it out, to say nothing of the possibility of a rescue for us."

"Here, take this gun," directed Hamilton. "I'll try Bob's interference piercer."

He took a small disc resembling a microphone from his pocket and started for the communicator.

"What the dickens is that?" asked Williams.

"My brother's latest invention," was the reply. "It is still in a purely experimental stage but it may help. It raises the pitch of the signals far above the pitch of the ordinary communicator and it will get through any ordinary interference wave. Bob has the only other one and our only chance is that he may have it hooked in and be listening. It's a pretty slim chance, I'll admit, but it is a chance."

HE carefully connected the interference piercer with the communicator on the wall and sent out a call. There was no result and he adjusted the instruments and called again. Silence rewarded his efforts. Again and again he made delicate adjustments and sent forth his calls but without response. He gave it up at length and started back toward the guns when a tiny whisper of sound came from the communicator. With a bound he was back at the instrument and was feverishly toiling at the adjustments. Gradually the voice came in clearer until all could hear the words issuing from the instrument.

"—Hamilton speaking," came from the instrument. "General Hamilton speaking. Is that you, Charley?"

"Bob!" cried Captain Hamilton. "Where are you?"

"I am at Balinsky's laboratory at Pole Mountain, but the more important thing is, where are you?"

"At Nashky's base in the Gobi, near Pilutai, as well as I can make out. Williams of the Secret Service, Jane Hunter and I are here, besieged in the lookout tower of an old monastery which Nashky has converted into a stronghold for his use. Can you come after us?"

"Not a chance, Charley. You have no idea of the condition of things. The world is about finished, old man. There are solvite areas on all sides of us and in another week they will cover the whole of North America. Even if I could come after you, what could I do against Nashky's ship?"

"Plenty, Bob. Listen. I have been working here for a month and I have managed to do something. Inside the magazine of Nashky's ship is a shell that looks just like his solvite shells, but it is full of radite. It has a detonation fuse attached to it set for 75XC/2. All you have to do is to get within three miles of his craft and send out a wave and he is done. The radite will set the solvite loose and you know what that means."

"No ship can cross the affected areas."

"Yes, one can. I'm a physicist and not a chemist, but Williams has been working in Nashky's laboratory and I'm going to let him talk. I think that he knows something."

Williams hastened to the communicator.

"This is Operative Williams, General," he said. "I have the secret of combating solvite. At first I thought it worked on the ether, but it doesn't. It works on nitrogen and disintegrates it entirely. Practically everything has nitrogen, either in its chemical makeup or else occluded or dissolved in it and so it goes up. An argon screen will stop it entirely."

"How are you going to confine the argon?"

"Alloy duralumin with one-half of one per cent of palladium. The alloy will occlude nearly a hundred volumes of argon under the proper conditions. Anneal the stuff almost at the melting point in an atmosphere of argon. Blow fresh argon through your annealing furnace until all traces of argon have been washed out and then chill it suddenly in liquid argon. It is a perfect screen against solvite. Enclose yourself in a shell of that stuff with an atmosphere of argon and oxygen inside and you are safe. Enclose a ship in a shell of it and it will cross the infected areas safely. Nashky has

his ship thus equipped. Look out for solvite around here, though, when you get out of the ship. We are full of it here. Nashky takes his ship in and out through a double port to be sure that his argon is confined."

"Our metallurgists will be at work in ten minutes," replied General Hamilton. "You can look for a rescue party as soon as we can make up a ship like you suggest. How many men has Nashky?"

"About two hundred Russians and over a thousand Mongolians."

"Pretty heavy odds, but we'll try it. We can muster only about three hundred effectives all told, but we'll see what we——"

There was a raucous crash and then silence from the communicator.

"Nashky wrecked it," reported Williams as he rejoined Hamilton and Jane Hunter. "However, we got our message out and now all there is to do is to hold the fort and wait for a rescue party."

"Holding it may be more of a job than we are counting on," said Hamilton grimly.

"I think that we are safe if we can get a stroboscope rigged up in time," replied Williams. "Nashky won't dare to use anything heavy this near his dome for if he lets the solvite in, he would be in as bad a fix as we would be."

"Tell me how this all happened," begged Jane as Williams and Hamilton began to connect the stroboscope which would prevent bullets from entering the loophole through which their guns were trained to fire.

"I don't know much about it," confessed Hamilton. "I had just finished setting the fuse on the radite shell I had introduced into Nashky's magazine when I saw the communicator glow and I heard Williams' voice telling me to hurry to the cell where we were first taken. What happened to you?"

"When we were separated three weeks ago, I was left in the cell," replied Jane. "I was kept on general labor and they worked me pretty hard, I can tell you. I had to keep up with those Mongolians, but I kept my spirits up, for I knew that both of you were working for me. This morning I was moving some boxes and my shirt got caught on a corner and it tore open. I covered up my bosom as rapidly as possible but one of the Russians who was superintending the work saw me before I could do so. He came over at once and, despite my struggles, he tore my clothes open and then ordered me seized and taken to my cell. They were dragging me toward it when you two appeared and shot my captors. That is all I know about it."

"I can supply the rest," said Williams. "I have been working in the laboratory for two weeks and that was where I learned about solvite. I hadn't seen either of you face to face for a week for I didn't dare to risk suspicion by looking you up, but I kept tabs on both of you by means of an X-ray television set in the laboratory. I happened to be watching Jane when she tore her shirt and I switched into the magazine wavelength and warned Charley before I started out to try and rescue you. I had located this place and stored it over a week ago and had it all planned to make a break for it soon, but I wanted to stay in the laboratory until I learned how to neutralize the solvite. I believe that Nashky knows, but if he does, he is the only one who does. I have learned this much, however; it is not permanent. The effect begins to diminish in about ninety days and in two hundred days it entirely passes away. I learned a good deal about Nashky's plans. He plans to let the solvite run its course until only a few small areas are clear of it and then to visit these areas and capture women and bring them here. He will hold them captive until the two hundred days have passed and then he plans to repeople the world with these women and his followers. It is a devilish——"

"Here they come!" cried Jane.

Williams broke off his talk and seized a machine gun. From the doorway leading to the roof the Mongolians and Russians streamed over the roof, clad in a peculiar flexible armor. The radite-charged bullets had no apparent effect on them and they pressed forward. They were battering at the door when Williams ceased firing and threw open his shutter.

"Do you see this?" he cried, holding up a black object. "This is a radite bomb. Unless this roof is cleared before I count ten, I will explode it and this place and everything in it will go up. *One! Two! Three! Four! Five! Six!*"

He ceased counting and laughed. The roof was deserted.

"As long as we can scare them off, we are safe," he said. "Did you realize what that armor was? It was merely a wire mesh connected with a Nashky generator downstairs supplying power to each one. Nothing could have penetrated that screen."

"What next?" asked Hamilton.

"Nothing. The next move is up to Nashky. He won't dare to try force for he knows that we know just how much mercy we can expect from him if we are captured and that we would probably just as soon go to glory by exploding a solvite bomb here as to have him throw us out into the solvite outside. He'll try to catch us napping, however, so we must stand watch and watch and never leave the observation post for an instant, day or night. We have food and water here for six months and I'll give General Hamilton two weeks before he is battering away at these walls."

"LIFE," said Feodor Balinsky, "even human life, which is commonly presumed to represent the highest development on the planet, is merely a matter of chemical changes, with all of which we are well acquainted."

He was speaking in the main lecture room of his laboratory at Pole Mountain and his audience was the little group of scientists who had gathered there to offer the last futile shreds of resistance to Ivan Nashky.

When the messages of Williams and Hamilton had been received two weeks before, the lethargy which had temporarily overwhelmed the gathered scientists disappeared like magic and was replaced by a scene of bustle and hurry such as had seldom been seen before. Often men had fought against time to save their lives, but this was the first time that men had fought against time with the fate of all life on the planet depending upon the results of their labors. The first task had been to protect the laboratory against the approach of the solvite which at that time was less than seventy-two hours away. Balinsky had a small amount of palladium among his stores and it was hurriedly alloyed with duralumin by the metallurgists while huge air compressors were started to liquefy the air in order that the argon could, by a series of fractional distillations, be extracted from it. A supply was soon obtained and the ingots of palladium-

duralumin alloy were annealed in the manner which Williams had described. When the process was finished, the ingots were rolled into huge sheets, paper thin, and these were secured to a framework to make a hemispherical dome over the laboratory and the surrounding grounds. The work was accomplished just in time for the air had hardly been replaced with a mixture of argon and oxygen before observers reported that the solvite infection had reached them.

The task of constructing double locks was pushed forward and double doors of such a size that a large aerostat could be safely let out into outer air were constructed. The construction of an aerostat with propellers and elevating fans of the precious alloy and armored with a skin of it was the next step. The matter of bushings and housings for the propellers and elevating fans offered some mechanical problems but they were solved and eventually the projected craft, fully manned and equipped, among other things with a huge detonation projector, had sallied forth and taken the air and had started toward the base in the Gobi desert from which Nashky operated. There had been no difficulty in finding it. At full speed the armored aerostat drove toward it, to be met two miles away by Nashky's black menace. Nearer and nearer the two ships ranged. Through binoculars, General Hamilton looked out through a port through which a gentle stream of argon was blown, driving back the poisoned nitrogen which would have turned the ship and crew into shapeless masses of matter had it penetrated into the interior. His eyes were glued on a gun port in the forward end of the Nashky craft while at his side an engineer kept the detonation projector, set at 75XC/2, carefully trained on the oncoming craft. Presently the gun port slid open and the muzzle of a three-inch rifle projected out.

"Fire!" exclaimed General Hamilton.

The engineer closed a switch and a dull report shook the aerostat. The engineer released the lever and closed it again and once more the dull boom sounded. The second detonation was unnecessary. Even before it sounded it was evident that the black ship was falling. Fascinated, General Hamilton and the engineer watched the mighty fabric lose shape and plunge, an amorphous globule of black and silver, to the ground, where it spread slowly over the ground like a ball of tallow melting before a hot fire.

"Sic transit gloria mundi!" exclaimed General Hamilton as he watched the doom of the mighty engine of destruction which had depopulated an entire world, now crushed by the very power which it had employed to work its evil.

The black monster disposed of, the rescue ship turned its attention to the great dome of silvery material which loomed before it.

"If that skin is as thin as the one at Pole Mountain, we can ram right through it," remarked the navigator of the aerostat as he joined the General.

"I doubt if it is, but we can try," replied the General. "Full speed ahead!"

The aerostat leaped forward at a tremendous speed. Nearer and nearer to the dome it came. It seemed as though it were about to strike when, a few feet from the silver metal, the ship came to a halt with a shock which nearly caved in the bows. Despite the utmost power that could be coaxed from the atomic engines, not an inch nearer to the shining skin could the ship get.

"Of course!" cried General Hamilton. "We should have expected a protective film of energy from a battery of Nashky generators. I had overlooked the certainty of that."

"We can return and equip the ship with a Hamilton generator, General, and come back here and put them out of business, can't we?" asked the engineer. "We won't have that ship to worry us and we can take our time getting on their primary wavelength."

"Unfortunately, Nashky has so improved his apparatus that I doubt the efficacy of the Hamilton generator against it. However, with plenty of time, I may be able to tune it in long enough to let a crew through even if I can't kill it permanently."

"I'll be glad to lead a storming party, sir."

"Thanks. I'd lead it myself if there were any use in it. He's my brother, you know. However, there is no use in discussing that. Even if we could breach the walls, we would only be slaughtered without advancing our cause. Allowing that a hundred were wiped out when that ship went down, it still leaves us up against odds of something like eleven hundred to thirty, a little more than we can hope to fight against. We have got to either get some reinforcements somewhere, and I don't suppose there are any people left alive on the earth outside of here and Pole Mountain, or else use strategy. The next thing is to get into communication with the prisoners."

"Their communicator is wrecked, isn't it, General?"

"It is silent, which may mean that it was wrecked by a greater interference load than it was designed for, or that Nashky has shut off the power. However, Charley still has his interference piercer or I miss my guess. I can't conceive of an overload wrecking that. We had better go home and let me try to rig up a sender of sufficient power that it will affect his instrument directly without the aid of a communicator."

Sadly enough, for all their partial success, the aerostat had returned to Pole Mountain and reported their failure. General Hamilton had plunged into his experiments while Balinsky, after brooding over Hamilton's words for a day, had summoned the chemists and surgeons among the survivors to meet with him in the laboratory lecture room. They had assembled and Balinsky addressed them.

"I repeat my assertion," he went on, "that life is merely a matter of a series of chemical changes. Does anyone dispute that statement?"

There was a silence and Balinsky resumed.

"Fifty years ago," he said, "Doctor Alexis Carrel demonstrated that tissue, unattached to any complete living organism, could be kept alive in the laboratory and could even be made to grow and multiply. This was the basis, as you all know, of the present method of growing tissue to replace that destroyed or removed from the living body. The replacement of portions of flesh or skin has been commonplace for thirty years and during the last decade the medical profession has advanced to such a state that even whole limbs have been successfully manufactured and grafted upon living persons. That leads us up to the point which I intended to make when I started.

"It has been the opinion of many great surgeons and chemists, I among them, that it is perfectly possible to construct an entire human being from laboratory-grown tissue and to have it function normally as a living being. The classical way to start such an experiment would be to take portions of each type of tissue from a

living body, grow them in cultures, and from this base build up the complete body. While it has never so far been done, to my knowledge, I imagine that you will agree with me that such a feat, while very difficult, is probably not impossible."

"The greatest difficulty would be the manufacture of the brain tissue and the proper connecting of that tissue, once you had it grown, to the complex system of nerves which it would be necessary to install in your synthetic body," said Dr. Von Helmer.

"That, Doctor," replied Balinsky, "is your portion of the experiment. I think that every one here will concede that you know more of the mechanism of the human brain than any other living man. I expect you to connect up the nerves and brain after I have supplied the tissues and assembled them into the proper form."

"I'll try it."

"That is all that I ask, Doctor. I thank you for your offer of cooperation. My idea is this. General Hamilton says that we must have reinforcements from somewhere in order to cope with the brute force of the hordes of savages whom Nashky has assembled at his base. Since there are no living persons in the world to whom we may turn for help, it behooves us to manufacture our personnel the same as we manufacture our material."

A SUPPRESSED murmur of excitement and suppressed applause rose from his listeners at the sheer audacity of Balinsky's suggestion. He waited until the disturbance had died.

"Is there anyone here who will not aid the experiment to the limit of his ability?"

A silence replied to his question.

"In order to get heart and brain tissue, it is quite probable that at least one person must lay down his life."

A dozen men were on their feet in an instant clamoring for the honor.

"Thank you, gentlemen, I will select my man and call on him—when I am sure that I need him. As I said, the taking of such tissue would be the classical method of procedure but it is not the one which I wish to employ. I have another and more daring plan. Doctor Ruthven, you know more about the rare gases of the atmosphere than anyone else. Tell us what you know about argon."

The aged British scientist rose.

"Lord Rayleigh," he said, "was the first to observe that, while specimens of oxygen and other gases made purposely from various sources always had the same density, nitrogen was an exception. One litre of nitrogen made from air, and supposed to be pure, weighed 1.2573 grams. When the gas was manufactured by decomposition of various compounds, such as urea and certain oxides of nitrogen, the mean weight of a litre was always found to be 1.2505 grams. This difference, amounting to about seven milligrams, was much greater than could be accounted for on the hypothesis of experimental error and Rayleigh suspected that some heavier gas was present in atmospheric nitrogen. In 1894, Sir William, then Professor, Ramsey obtained pure argon by the removal of the greatly preponderating nitrogen by means of magnesium. This new gas had a density, referred to the base of oxygen equals thirty-two, of thirty-nine, point nine, more than one-third heavier than nitrogen. Its molecule consists of one atom, hence its atomic and molecular weights are the same. When liquefied, it boils at—186° C. and when frozen, it melts at—189.5°C. Aside from the facts which I have given you, little if anything is known about it. It has never been found to enter into any form of chemical combination. In fact, its name signifies this fact, for it comes from the Greek word, αργος, meaning inactive or lazy."

"Have attempts ever been made to activate it and make it enter into chemical combinations?" asked Balinsky.

"Not in recent years, to the best of my knowledge. Nothing was expected to be gained from such a combination and I think that little, if any work has been done along these lines."

"As I understand it, the gas more nearly resembles nitrogen than any other, except for its failure to enter into chemical combinations."

"In a broad way, yes."

"Do you think that you could make it enter into chemical combinations with the valence and characteristics of nitrogen?"

"Possibly. By occluding it in platinum and exposing it to radium emanations or to a high tension arc at enormous temperatures, it might be activated. What the valence would be in such a case, I cannot even guess. Why do you ask?"

"Since argon is the only substance which is not affected by solvite, it is my plan to attempt to build up tissue in the laboratory, substituting argon in place of nitrogen, and thus get soldiers who need no protection, but who are able to go into a solvite-affected area freely and safely."

Again the murmur of excitement and applause rose, but Doctor Ruthven leaped to his feet.

"I am sorry to shatter your dreams, Doctor Balinsky," he said, "but it is my idea that the reason why argon is not affected by solvite is its inertness, the very property which you propose to destroy. If you succeed in activating it to the extent to which nitrogen is activated, will it not, in all probability, be as readily affected by solvite as nitrogen is?"

"Such may be the case but should it prove to be so, we are no worse off than we would be if we constructed our synthetic men on a nitrogen base to start with. If you will initiate your experiments at once, Doctor Ruthven, I will be in a better position to predict the ultimate success or failure of mine. In any event, for the benefit of the persons assembled here, I will announce something which I had intended to give out just about the time that this great trouble came on us all. My students and I have actually succeeded in creating life in the laboratory. That is, we have artificially made from inert substances, tissues of many sorts which have lived and multiplied under laboratory conditions. We have even gone so far as to create a ball of tissue which we have covered with a skin and exposed to sunlight and air and it has lived, moved, taken nourishment through its skin, exhibited all of the phenomena of metabolism, including that of excreting waste products through the pores, and has continued to live, thrive and grow larger for several months. Consequently, with Von Helmer's assistance, I feel confident of our ultimate success in creating a living body, in physical characteristics, at least, resembling a human being. Whether we will be able to substitute argon for nitrogen in its tissues, I cannot predict and whether the being we create will be a rational thinking being, I cannot state, but at least, gentlemen, we will do our best."

"May I ask just one thing, Balinsky?" spoke up Von Helmer.

"Certainly."

"Have you ever read Mary Wolstencroft Shelley's book, 'Frankenstein'?"

"I have not."

"I have a copy and before you start your experiments I will ask of you as a favor that you read it. Understand this; I am perfectly willing to help you to the limit of my abilities but before we start I want you to read this book and realize exactly the risk which you are taking."

THROUGH their argon-protected periscope the prisoners had watched the destruction of Nashky's ship and the abortive efforts of their rescuers to penetrate the wall of resistance offered by the Nashky generators.

"Damn those generators!" exclaimed Williams. "When I said that your brother would be hammering at these walls in two weeks, I reckoned without those things."

"Well, he can't get in to help us and we can't get out to help him, so what is next on your schedule?" asked Hamilton.

"We *must* help him. We may not be able to get out to do so and we might not be able to do much good if we did get out but inside we may be able to do a great deal. We must destroy those generators."

"You're crazy!" exclaimed Hamilton. "We are cooped up here unable to get near them to destroy them or anything else. Even if by some miracle we could reach them, none of us knows enough about their construction to do them any damage that Nashky or some of his assistants could not repair in a few minutes."

"I'm not so sure about that."

"What do you mean?"

"Do you remember his attack on St. Helena?"

"Certainly."

"The Nashky generators there were completely done up."

"That was done by solvite."

"Yes, by solvite 'B' which is active only locally. We have plenty of that here. We also have plenty of radite bombs and the gas from a radite explosion contains nitrogen. Now do you understand or must I put it in simpler words?"

Captain Hamilton rose and bowed gravely to Williams.

"Ralph Williams," he said solemnly, "you are a genius. When and if we ever get out of this mess, I am going to get Von Helmer to remove a portion of the stuff which fills my skull and replace it with a good grade of sawdust in the hope that it will improve my mentality."

"Stow that stuff," returned Williams, "I just happened to think of it. You are the one who is going to do it. Can you make a detonation fuse?"

"Easily."

"That is the first step. Can you make a detonation projector?"

"Yes, a crude one, but one that will send a wave a half mile."

"That will be strong enough. Get to work at once and fix one of those radite bombs with a detonation fuse and fasten it to a solvite 'B' bomb, so that the radite will set if off when it explodes. Then make a projector so that we can fire them off from here. Now for the third thing. Can you rig up an emergency communicator which will send for a couple of miles?""

"I doubt it."

"It is not essential, although it would help, for it would enable us to notify your brother just when we fire our bomb. However, if you can't do it, it can't be helped. We musn't expect everything. How long will it take you to get the fuse and projector ready?"

"I can fix the fuse in a day or two but it will take considerably longer to fix up a detonation projector which will work. It will possibly take a week; probably two."

"All right, get to work on it. We will relieve you from your guard shifts and Jane and I will take eight hours on and eight off. Can you stand that, Jane?"

"I was wondering how soon my turn would come to do something. I came along in the hope that I would be able to do something, but so far I have been nothing but a burden on your hands."

"Not by a long shot you haven't," said Captain Hamilton warmly. "If it hadn't been for you, we could never have kept going as long as we have. You have been of as much value as we have in keeping watch and if it had come to fighting, a third machine gun might easily have turned the day in our favor. Don't think for a minute that you have been anything other than a big help."

To a mechanic like Captain Hamilton, a simple matter like a detonation fuse presented no difficulties and two days of work produced one which he pronounced after test, as mechanically perfect and ready to be attached to a solvite shell. Given a machine shop and the materials which he wanted, a few days would have seen the end of the whole task but he was continually forced to improvise and substitute. His first model failed to carry the wave over five feet and he was forced to tear it down and start fresh in an attempt to make his apparatus more powerful. He worked fourteen hours a day at it while Jane Hunter and Williams stood guard, eight hours at a stretch. The strain was telling on all of them, but Hamilton was doing his best and all of them tightened up their belts and stuck grimly to their tasks.

Almost daily some attempt was made to take them by surprise, but the quick challenge of the one on guard and a prompt showing of the dreaded radite bomb was enough to put their attackers to flight. After six weeks of unremitting labor, Hamilton threw down his tools one evening and announced that his task was completed.

"Will it work, Charley?" asked Jane as she looked at the crude machine before him.

"It will," he replied. "I have had hopes for a week that it would, but I said nothing until I had it completed and tested. It is not very powerful but it will project a wave as far as the limits of the duralumin screen and I have reconstructed my fuse to make it exceptionally sensitive. It would not be safe to fire a gun in the same room with it for even that slight shock would probably set it off. The only thing left is to locate those generators. I will rig up a sound locator tomorrow that will find then in a hurry and then train my projector in the right direction. The only thing left is to place the bomb and Ralph can do that tomorrow."

"I'd be mighty glad to, old man, but I am afraid that's your job," said Williams from his couch. "I don't know ten words of Russian."

"I don't know one," retorted Hamilton.

"Good grief! How are we going to plant it?"

"I thought you had that all planned out."

"I expected you to do it. We can easily blow the light fuses and in the darkness I expected you to run the gauntlet and place the bomb and come back. Where did I ever get the idea that you could talk Russian?"

"I'm sure I don't know. I can't talk a word of it."

"I can," interrupted Jane.

"How come?"

"I lived on St. Helena for six years and I used to talk with some of the prisoners nearly every day. I can talk it like a native. I haven't been of much use so far but now I can be. I'll place the bomb."

"Nonsense!" exclaimed both men in unison.

"It's not nonsense. It's no more risky for me than it would be for you if you spoke Russian and since you don't it isn't half as risky for me as it would be for you. Besides there is about ten times the chance that I will be successful that there is that one of you would be, and we won't get but one chance at it. It the one who tries it is detected, no other attempt will ever have a chance."

"She's right, Charley," said Williams.

"I won't listen to her taking that risk."

"Don't listen then, Charley. Plug your ears and look the other way because I'm going to do it."

"You're not! I'll do it myself."

"Not a chance, Charley. If Jane doesn't, I'm the one to try it. If I am caught, you can make up another fuse and make another try at it, but if you were caught the whole works would be up. I couldn't make a fuse if I had to. But I'm not going to try it either, Jane is."

"I won't stand for it."

"Then sit down. I know just how you feel, old man, and so does Jane, although you haven't said anything, but it's two to one against you and she is elected."

Captain Hamilton subsided into a sulky silence and Williams went on.

"It really isn't as risky as it seems at first glance. When we blow the fuse and put out the lights, there is going to be a good deal of disturbance and excitement below. Jane can slip out and get over the roof in a few moments and then slip down to the generator room and plant the bomb and get back to the roof without much chance of being detected. From there it is easy sailing for we can cover her retreat with the guns and with the solvite bomb, if we find it necessary."

"When shall I make the attempt?" asked Jane.

"As soon as we can get the generators located is as good a time as any, I guess. What did you say, Charley?"

"I didn't speak."

"I thought you did."

"So did I," cried Jane. "Listen!"

The three sat in tense silence. For a moment nothing was heard and then Williams spoke.

"There it is again. It sounds like Charley's voice from a distance."

With an exclamation of disbelief Hamilton sprang to his feet and dashed to the other side of the room. Attached to the useless communicator was the little interference piercer which he had attached months before. He picked it up in a gingerly manner and pressed it to his ear.

"What is it, Charley?" cried Jane excitedly.

"Hush! It's Bob's voice!"

"Impossible!" ejaculated Williams.

"Shut up! I want to hear this."

He listened intently for several minutes and then dropped the disc and picked up some tools.

"What are you doing?" asked Williams.

"Don't interrupt. Bob told me how to modify this thing."

FOR half an hour he labored at the device and then reconnected it with the communicator and listened intently. He took the disc from his ear and spoke quietly and distinctly into it.

"This is Charley, Bob. Can you hear me?"

He replaced the instrument to his ear and then turned to his companions with an expression of exultation on his face.

"Communication has been reestablished with the world!" he announced.

Williams and Jane pressed forward.

"Get the news," begged the former.

"All right. Wait a minute until I make an adjustment."

He tightened the diaphragm of the interference piercer and spoke into it again. He listened carefully for several minutes and then turned to his companions.

"The news is good," he said. "Our messages got through just in time. So far as Bob knows, the whole world has gone under with the exception of this place and Pole Mountain. They have a palladium-duralumin dome like this one, filled with argon-oxygen atmosphere and they have about three hundred effectives and about five hundred women and children assembled there. Bob says that they have got reinforcements from some place, I couldn't make out where, and they are ready to make another attempt on this place. He wants to know how thick our shell is."

"Let me talk," cried Williams as he took the instrument from Hamilton. "Hello, General Hamilton, this is Williams. The shell here is about an inch thick, that is, the main shell. I don't know how thick the doors are. I am afraid that you couldn't ram successfully, if that is what you are planning on. When were you planning to attack? Don't do it. Wait another twenty-four hours and we may be able to help. What? The Nashky generators? Don't worry. We have our plans all made to put them out of business. Can Nashky tap this device and hear what we are saying? No? Good enough, then I can talk. Wait at least twenty-four hours. Keep us advised of where you are and keep far enough from here so that a sound locator can't get your elevating fans. When you get the word from us, come ahead as fast as you can. We'll put the generators out of business so that you can blow the shell with radite. If we are lucky, you will be able to get to us and take us on board before the argon is dissipated enough to let the solvite start work on us. Never mind trying to do Nashky and his crew, the solvite will take care of them as soon as you blow this shell. Blow this place up, no matter what you do, even if you have to send us to Kingdom Come along with the rest of it. As long as this base stays here, you are in constant danger. Yes, sir. No, sir, I don't think so. Yes, sir, we will do that. Very well, sir, we'll start listening in for you in about twenty-four hours."

He turned to Captain Hamilton.

"All plans made," he said. "Get busy on the sound locator so that we can get those prepared bombs placed."

"All set," said Captain Hamilton tensely.

"Right!" replied Williams. "Are you ready, Jane?"

"All ready," she whispered.

" 'Then, Gridley, you may fire!' "

Captain Hamilton bent over an improvised induction generator and turned it rapidly by means of a crank. A low note became audible, rose to a shrill whine and died

away in silence and Hamilton's grunt as he strained at the crank became audible. A sudden *ting!* sounded on the air and the interior of the dome was plunged in intense darkness. Williams opened the door of the watch tower and Jane slipped out on her errand of destruction, the deadly bombs with the detonation fuse gripped close to her body. The listening men heard a gruff challenge from the doorway followed by an answer in Russian in Jane's voice. The guard replied in a suspicious voice and Captain Hamilton gripped his pistol tightly and made ready to rush to her assistance. Jane's voice rang out again with an imperious note and the guard could be heard to move back.

"Thank God, she got by him," muttered Williams. "The rest should be easy for her."

For five minutes the two men sat tense in the darkness waiting for the sound of Jane's return.

"I'm going after her," announced Hamilton with sudden determination.

"Sit down, you fool! You'll only add to her danger if you try any stunt like that."

"Let go of me! I'm going——"

Without warning the lights suddenly flashed on and the interior of the huge dome was as light as day. Just as the lights came on there was the sound of a scuffle just outside the doorway leading to the roof, followed by a feminine scream. With an oath, Captain Hamilton tore himself loose and ran across the roof, Williams at his heels. Before they reached the door there was a high pitched yell that ended suddenly in a bubbling grunt and Jane appeared in the doorway, a knife streaming with blood in her hand. After her came a dozen Mongolians in hot pursuit.

"Down, Jane!" shouted Hamilton.

Obediently she dropped flat and Hamilton's heavy pistol barked a defiance to her pursuers. The Mongolians had had no time to don their protective armor and they went down like tenpins before the deadly accuracy of Hamilton's fire. The survivors paused and Williams sprang forward and lifted Jane to her feet, and raced toward the watch tower with her, Hamilton covering the retreat with his pistol. Hardly had the door of the tower slammed behind them than a fresh group appeared in the doorway clothed in the generator-fed armor. Williams picked up a radite bomb and threatened their advance. They hesitated, but urged on by a Russian who remained discreetly in the rear, they disregarded the threat and pressed forward.

"Barricade the door! Quick!" cried Williams as he ran to the improvised communicator.

"General Hamilton!" he cried into it, "Come ahead and hurry! We are being attacked in force and I don't know how long we can hold out!"

He dropped the communicator and hastened back to aid Hamilton in dragging everything movable in the room against the door. Outside, a hundred Mongolians howled and attacked the door with axes. The massive teak withstood the attack for some time, but gradually it began to splinter.

"Fire the bomb, Charley!" cried Williams. "If you don't, it will be too late."

Hamilton bent over his makeshift detonation projector and closed a switch. A dull boom resounded in the closed room. Williams fired his pistol pointblank through the gap in the doorway at a grinning face but his bullet produced no result.

"Try it again, Charley!" he cried. "The first shot didn't do it."

Hamilton bent over the projector and worked desperately. Again and again the dull boom resounded through the room, sounding over the blows of the axes which were rapidly enlarging the hole in the doorway. It was large enough now to admit a man and the attackers drew back and one of them began to worm his way through. Williams struck at him with an axe but the blows were warded off by the impenetrable armor which the man wore. Again Captain Hamilton closed the switch of his projector. The dull boom sounded just as Williams swung his axe again at the head of the entering figure. The blow went home and the Mongolian fell forward.

"To the guns!" shouted Williams.

From the two machine guns mounted on each side of the doorway came a stream of fire and the surviving Mongolians turned and fled as they realized that their armor no longer protected them. As they did so, Hamilton turned again to his induction generator and in a few moments the dome was plunged in darkness.

"Good Lord, we've done it now!" gasped Williams as he pointed toward the dome above them. Through a hundred holes the sunlight was streaming.

"The argon will leak out and let nitrogen in and then the solvite will take care of this place," he cried. "Some one shot a little too high. It won't be long now."

"Look!" cried Jane from the periscope, "Here comes the ship!"

Abandoning their guns, the two men joined her and gazed at the ground glass screen of the periscope. Only a few miles away and splitting the air like a rocket, came a heavy cruiser with the colors of the United States emblazoned on her bow. Her propellers were suddenly reversed and she slowed down and came to a halt a few hundred yards from the dome. From her bow a gun spoke and under the influence of the radite shell a large section of the skin of the dome disintegrated into gas. Again the gun spoke and another section disappeared. Through the gap thus formed the ship drove at a high speed and came to a halt on the roof. A door opened and a party of men streamed forth. With them they brought three shining boxes that looked like coffins. Six of them raced toward the watch tower with these boxes while the balance threw themselves into a skirmish line before the door leading into the interior of the building.

The men with the boxes sat them down and threw them open.

"Quick!" cried the leader of the rescue party. "Miss Hunter! Captain Hamilton! Mister Williams! Into these boxes at once!"

The three prisoners squeezed through the doorway and leaped into the coffin-like boxes which were instantly slammed shut on them. The six men picked up the boxes and carried them at a run to the waiting ship. Through double ports they introduced them into the body of the craft. A shout from their leader brought the skirmish line to the ship and with her crew and the rescued three on board, the aerostat shot out through the opening which her gun had blasted in the dome.

The lids of two of the boxes were opened and Captain Hamilton was soon wringing his brother's hand while Williams was receiving the congratulations and thanks of General Hunter.

"Where is Jane?" cried Captain Hamilton.

"Still in her box," replied his brother. "Look at this and you will see how close a shave you three had."

Captain Hamilton looked at the closed box and shuddered. In closing the box, a portion of Jane Hunter's garment had been left outside. It had lost form and drops of a gummy plastic substance were running down the sides of the box.

"Bring an argon cylinder!" directed General Hunter.

A cylinder of liquid argon was brought and while two men threw open the box, a third directed a stream of the protecting gas on the edge of the garment while a fourth man cut off a portion with a pair of alloy shears.

"Throw it out!" directed the General.

The cut off portion of the garment was picked up in a pair of alloy tongs and dropped through a double port into the outside air.

"Do you wish to take a last look at your prison?" asked General Hamilton.

Jane, folded in her father's arms, made no reply. Williams and Captain Hamilton stepped to an argon protected porthole and looked at the huge dome before them. As they watched, the door opened and a figure appeared. It staggered forward for a few steps and then slowly collapsed and lost form, spreading in a great blot of color over the landscape.

"Did you recognize him?" gasped Williams.

"Nashky!" replied Captain Hamilton.

"I had an idea that he had not gone up with his ship, but I wasn't sure of it. At any rate, that's the end of him."

"THERE is one thing that has been puzzling me ever since we got your message, General," said Williams. "You spoke of getting reinforcements from somewhere and I can see that you have them. Where did you get them and what sort of men are they who are able to go out into the poisoned air without argon protection?"

"Well," replied General Hamilton, "that is a long story, the details of which you must wait for until we get to Pole Mountain. I am not a chemist and I doubt if I could explain, for I hardly understand it myself. The nub of the thing is that they were not born at all; Balinsky manufactured them in the laboratory. When we learned what your situation was, we sent a rescue ship after you and managed to destroy Nashky's ship but we couldn't force a way into the dome. We didn't have strength enough to do so even if the Nashky generators had not been in operation and we know that we needed help. There were no people left alive, so Balinsky started in with Von Helmer's help and made these soldiers you have seen in action today. The reason that they are able to go into the solvite areas without argon protection is that they contain argon in their flesh instead of nitrogen. The nitrogen that is in the ordinary human body had been replaced atom for atom with argon."

"But argon will not enter into chemical combinations," objected Williams.

"It won't ordinarily, but Ruthven of Liverpool is among our group and he managed to activate it so that it would enter into combinations with the same valence and chemical characteristics as nitrogen."

"In that case, I should think it would be affected by solvite."

"So Ruthven feared, but it turned out not to be so. These men are entirely immune to solvite and can work in it without trouble. We had about fifty made when we left and I expect that Balinsky will have quite a few more ready by the time we get home. You told us that solvite lost its power fairly soon; in fact we can see that its action is diminishing in virulence already; and we are planning to make a few thousand of these fellows and turn them out and let them start getting the world policed up against the time when we can leave our sanctuary at Pole Mountain and resume our interrupted lives—those of us who are left."

"So it was Balinsky's doing, was it? Is there any limit to that man's genius?"

"None, so far as I know. He once almost wiped out mankind and then in turn saved a remnant and is the man who is going to make life on the planet again possible. Had Nashky's genius only been turned in the right direction, what a pair they would have made."

"CHARLEY," murmured Jane a little later, "I hope that our children are all boys."

"Why, dear?" he asked.

"Because I would hate to think of a daughter of mine growing up and marrying one of these synthetic men and I am afraid that that will be about all there would be for her to marry. They are brave and gentlemanly, but they can have no souls."

"Why not, dear?"

"Because they are made in a laboratory and a laboratory is ruled by science and not by emotion. It may produce a brain, but it can never produce a soul."

THE END.

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When Inca-Land Revolted

By Woods Peters

IT can hardly be beyond the realm of possibility for some young and enterprising scientist who has the rare gift of a good imagination (a distinguishing feature of the great scientist) to discover, albeit accidentally, a means by which to transmit personality. After that it would be only a minor matter to devise a means for accompanying such transmission with the voice. In this fascinating story of future achievement in science our new author tells, in an absorbing manner, of startling events in a hidden land.

Illustrated by BRIGGS

THIS is the story of an accidental discovery. As is true with many discoveries of mankind, it was the merest freak of chance that showed the trail, a trail that led not only through intricate diplomatic negotiations and a devastating one-sided warfare, but eventually opened the way for the mutual understanding between nations which we enjoy today. For without this discovery, not only would the countries of the world have come under the control of that strange and formerly unknown race of super-scientists from the supposedly savage country of inland Incaland, but our modern development of the science of transmission of the personality would be unknown save to a few who would hold an unbreakable power over the rest of the human race.

The term, "transmission of the personality," is perhaps a little vague, but it is the only term that has been coined to designate the scientific accomplishment.

Today the discovery is of as common use as was the radio in 1929, for the necessary electrical equipment has been brought within the reach of practically all, and the advantages the new science has brought us are common knowledge today.

Considerable expenditures of cash for trips to distant lands is a thing of the past. Telephones are practically obsolete, and ships and air lines are used solely for the transportation of food and freight, for while we have reached the stage where we can at will transmit our images, powers of the senses and personalities, it has yet been found impossible to actually materialize them in the form of physical matter at the receiving end.

We can sit before our personal sending instrument in our own home and with a twirling of the dials project ourselves into any part of the world we desire. We can there be seen by others or remain invisible as we desire, yet all the time we have full consciousness of the things that are taking place in that locality—sights, sounds and even smells—just as though we stood there in reality.

If you will look up the November issue of a certain magazine, issued in 1931, copies of which can be obtained in the larger libraries, you will find therein a story by a young imaginative author entitled, "The Scourge of the Alphites," which deals with miraculous appearances and disappearances of a peculiar, somewhat human form which later waged a terrible war upon humanity from a neighboring planet. The story tells in detail of the Alphites' apparently perfect knowledge of the plans for defense arranged by humanity, and how the enemy always managed to circumvent our counterattacks. The human race seemed doomed until an amateur scientist made a discovery that certain electrical impulses shot through the ether could prevent the appearance of the supernatural "ghosts," after which the people of the world found their defenses adequate, and the world was saved.

The author of that story little realized how close he was to the actual truth, for at that very time the scientists of that race we now know as the Ingols, from an apparent mixture of the old Inca and Mongol blood, were experimenting along these lines. The blending of those races at some time, far back in history, had not only brought out the scientific development of the Inca stock, but also the traits of the cruel and power-loving Mongols. It was this combination that for a time held the threat of world domination over us by them.

The final saving of the world was, I repeat, a purely accidental discovery.

Those in the laboratory watched the flyers roll out the planes . . . the huge hatch was being removed. . .

It was in 1962 that the first threat came. At the time it was not recognized as such, but was thought to be a series of supernatural demonstrations, and in the light of the growing knowledge of the supernatural world, was given but little serious thought.

It was in the same year that word had come from obscure sources, brought to the outer world by Indian runners, that an immensely wealthy find of old Inca jewels was made high in the Andes. Plans were immediately started for sending an expedition into that mountainous region in the interests of science and treasure.

IT was in the following year when the expedition actually got under way, that the first real warning or threat came, but at the time it was not recognized as such.

Members of the exploring party had landed on the South American coast, and setting their course from the city of Lima, had penetrated a considerable distance into the mountains, where they were suddenly confronted by a regal-appearing chieftain, who stopped the pack train and warned against further progress.

Another day's march and they were again stopped and warned, and as evidence of their impotency they were presented with a paper, giving extracts of their instructions regarding the disposition of the find. These papers had been in the sole possession of the head of the organization and were supposed to have been kept absolutely secret.

That evening a conference was held by the expedition leaders, and the following morning the line of march was suddenly changed, but apparently to no effect, for toward evening they were again stopped and a second paper, telling of what had taken place in the previous night's conference, was laid before them. Added to that was a still further warning of the dire consequences that would befall members of the party, should they persist.

Not to be daunted, and feeling that they were sufficiently armed, they nevertheless pushed on, and the world at that time knew only too well the results. As had been promised, one man only was allowed to escape, that he might carry to the outside world the warning of the Ingols, to keep clear of their territory.

Naturally, the American government would not permit the atrocity to go unpunished. A conference was called at Washington and plans laid to send air and land punitive forces into the fastnesses. When all was finished and the meeting ready to adjourn, a stilted voice spoke from the air beside them, warning that their forces would never return. It is sufficient to state that the warning was unheeded, though it momentarily threw consternation into the group, because the speaker could not be seen or felt. It is also sufficient to add that the punitive forces never returned.

For nearly two years nothing was heard of the Ingols, and people of the world had practically forgotten their existence. The government some time previously had given up all attempts to reach them.

Then the blow fell.

Simultaneously during the night hours of September 17, 1964, the cities of Washington, New York, London, Paris and Tokio were stricken. Warning to the outside world came through the silence of the telegraph and telephone, an ominous silence that brought forth an instant inquiry from the various world press associations. A few hours later, air liners starting for those cities came driving desperately to outside ports, telling horrible tales of an apparently instant death that had stricken every inhabitant.

A consultation of nations was immediately called to attempt to ascertain who was the unknown enemy. Delegates were rushed by plane to a central meeting place at Denver, and during their conference the next warning came!

It was a demand from the unseen voice to instantly acquiesce to subservience to the Ingols; failing that, dire consequences were promised. Naturally the nations refused, and perhaps equally naturally the unknown Ingol race inflicted the promised punishment. San Francisco, Shanghai, Manila and Berlin were found three days later to be cities of the dead.

It was a difficult thing to fight. Heavy air patrols were established at every city of importance in the world, but seemed to be of little avail. At times the swooping ships of the enemy would be sighted, but their speed and ability of maneuver were so far ahead of those modern planes known to civilization, that the latter were helpless.

A patrol would spot the enemy as a dot high in the sky, would attempt to swing to bring their guns to bear, only to find that the speed of the Ingol ships was such that they had struck their blow and were zooming high out of range before a single retaliatory measure could be taken.

It is true they did not entirely escape. A flight of nine enemy planes traveling at the 4100 meter level over Dallas, Texas, entered a storm area and upon coming into clear atmosphere at the far side, plunged unexpectedly full upon two patrols. Neither flight had time to touch a control and the resulting collision wrecked three of the enemy as well as the two American ships. But the accident brought no results, for the wreckage fell so tangled that nothing of the construction or motive power of the strangers could be determined, save that they were of a radically new type.

Scientists everywhere were working upon the problem, particularly with the view of discovering the means used by the Ingols to project their voices and to learn, if possible, whether other senses were projected as well. But their work apparently brought no results.

There was an amateur photographer working on the Portland *Evening Journal* who finally furnished the key. He discovered for himself a phenomenon, which was already known by other photographers and opticians, but it was his application of this discovery that pointed the way to final success.

MERLE AIKEN, and there are many who will recognize that name now that it is mentioned in this connection, was engaged in making some photographic copies. He had thrown the light of four 500-watt flood lamps upon the copyboard and had just brought the copying camera into focus. Turning to pick up a plate holder he accidently struck the ground glass of the camera, shattering it to bits.

The rest of the room was in darkness, save for the diffused reflection from the lamps, and Aiken stepped to a shelf on the far side to try to locate a duplicate focussing plate. The shutter of the camera was left open.

He could not find what he was looking for and, stopping a moment in puzzlement, he happened to glance toward the camera. The thing he saw was a new ex-

perience to him, and it was this newness that started him to thinking, where others of greater photographic knowledge would immediately have recognized it for what it was, and would undoubtedly have passed it by.

There in the clear air, where the ground glass had formerly been, was a brilliant image of the picture he was copying! Looking a little beyond or a little short of that particular spot in the air, nothing was visible, but with the eyes focussed on the proper plane, the picture was even more brilliant than it would have been with a glass interceptor.

He studied it a few moments in amazement, then changing the position of the lens a bit, he again tried to pick up the image in the air. It was without result. Taking a sheet of thin paper, he carried it backward from the camera until the image was clear upon it. Marking the place as carefully as he could, he again stepped back into the partially darkened room and attempted to look into space at the point where he had held the paper. Instantly the picture was again visible, seeming to stand free in the air some five feet to the rear of the camera.

Calling one of the men working near, he asked him to step before the floodlights. Placing the lens in front of him, Aiken again took his place at the far end of the room and after a moment there stood his companion, in natural color and with every changing expression of his face, suspended in nothingness!

Aiken could scarcely believe his senses. It was so radically new to him. Taking a ruler, he threw it toward the image. Naturally it passed through and beyond without in any way affecting the brilliance of the air picture.

Aiken also dabbled a little in radio, not enough to thoroughly understand all its principles, but enough to realize something of the unexplored wonders of radio vibrations.

Some days went by, with Aiken thinking more and more of the discovery he had made. If it was possible to project an image into nothingness by light, why not by some other form of vibration. But, of course, that had already been done. He suddenly remembered the experiments in radio photography where even moving pictures were transmitted hundreds of miles.

Well, why not go a bit farther? Why not hit upon some wave that could act not only as a sender, but a receiver as well? Within limits that had also been done. A telephone transmitter could be used also as a receiver; a radio receiver could be made to oscillate and send out those horrible howls that so annoyed him, when he was trying to get DX reception. True, those were but extremely crude beginnings of the idea he had in mind, but it was just possible that it could be done.

Merle Aiken had reached that stage in his reasoning when a second world conference was called at Denver. During that meeting the figure of the Ingol chieftain was suddenly seen standing at the side of the delegates' table. The place had been well guarded and the diplomats were stricken dumb with astonishment.

The President of the United States was the first to recover his equilibrium. Guards with fixed bayonets were stationed about the room. The President ordered the Ingol's arrest. Bayonets were lowered to "on guard" and the sentries advanced. The Ingol turned and smiled!

"You cannot touch me, gentlemen. I am not here." He calmly walked *through* the table and stopped on the other side. The guards attempted to seize him, but struck their own bodies together, while he stood, an intangible figure in the ether, unharmed. He spoke again.

"Gentlemen, it is impossible to reach us. We are here, yet we are hundreds of miles away in our mountain kingdom. Our scientists are far ahead of yours, as not only this phenomenon, or miracle as you may perhaps call it, shows you, but I would also call your attention to our ships of the air. It is impossible for you to touch them, save by an accident such as happened over your town of Dallas.

"Many years ago, before the beginning of your nation, that you call the United States of America, the Incas and Mongols were great races. The Mongols left the south country during the course of time, leaving but a trace of their blood, and have drifted far from the science and teachings that were developed by that people your archaeologists call the Incas.

"Most of us were wiped out by the early Spanish conquests, and those of other tribes that preceded them. But the more learned of our people took refuge in the Valley of Yakuzak. There we have lived and studied for hundreds of years.

"We have remembered the wrongs that were done us. Our hate is one that does not die. The time has come when Ingol-land demands payment. Every nation on the face of the earth shall pay tribute to us. We shall establish our governors in every capital. The profits of the world shall be ours, and the worship of the one and true Sun-God shall be the religion of the earth.

"It is at the instruction of the all powerful Sun-God that we have chosen this time to strike. Sacrifice is demanded, sacrifice of twelve beautiful maidens from each nation each year. Wealth is demanded, wealth to establish temples of the Sun-God throughout the world. Power is demanded, power to enforce the worship of the one and true Sun-God in all countries."

The Ingol's eyes glowed with the fires of fanaticism, sending a chilling fear into the hearts of the men listening to his voice.

"Shall it be a peaceful conquest? Will you save the lives and property of your nations, and turn them to the control of this most humble servant of the Sun-God, or shall we be forced to compel obedience?

"I have spoken. Thirty days remain for your answer, then. . . .!"

IT is needless to detail the consternation that was felt by those who heard his voice. With his last word the image vanished. How could this power be combated? The world already knew only too well how effective a war by the Ingols might be. What should be done?

The entire text of the Ingol chieftain's speech was made public, and appended to it was a plea for suggestions that might aid the world in the crisis it was then facing. Press dispatches of the episode naturally came to the attention of Aiken, and his consciousness suddenly "clicked."

"I've hit it," he whispered. "I've got the idea they are using, but what can I do with it?" So positive was he that he sent a telegram to the President telling briefly his theory of the means used. Aiken was summoned to Denver, and called into conference with the President and leading radio technicians.

He explained his discovery, old to them, though the application was new, and it was decided worth trying. What the value might be, they could not foresee, but if

"We've got it, fellows, we've got it!" Hastings exulted.

they could develop such an instrument, it would at least enable them to know what the Ingols were doing in their own country. It might prove the key to unlock greater things.

Days of frenzied work followed, experimenting with waves of every length. A carrier wave was finally located that would permit the projection of an image and its focus on a predetermined point in the atmosphere. It was a step, but did not bring the needed results.

"If we could only get more power at the focal point and less power in between we might make the point of focus serve as a broadcast station," was the suggestion of George Hastings, America's leading scientist in radio transmission. "But how can we do that?" The other scientists, worn out by their continuous labor, could offer no aid. Their minds refused to function.

Merle Aiken, knowing little of advanced radio, had stood apart throughout the experiments, watching with bated breath. He knew photography, but radio was a strange plaything to him. However, it was photography that gave him the next idea.

"Listen, Hastings, I've tried an experiment with my camera and it worked. Maybe you can find some way to apply it here. I set it up to project an image, then put a prism in the path of the beam to split it in two rays. A second prism reflected the beams back again, and by adjusting the reflecting prisms I once more brought the image to a focus, the angle of the reflecting prisms determining where the image would be cast in the air.

"With a single beam, the radiation from the ray was such as to cause a heavy fog on the plate when I was attempting to photograph the image, but with the

rays split, the carrier beam was invisible while the image stood out with its original brilliance. It photographed beautifully. Here, see?" He tendered the picture to Hastings.

The latter studied it a moment, then looked off into the distance.

"Hm-m-m! It may work. By heaven, I believe you've hit it, Aiken. Here fellows!" And he was immediately engrossed in a hurried explanation of the idea brought out by Aiken's experiment. Technical terms, instructions and suggestions far over the photographer's head left him dizzy, and he stepped outside to await further developments.

The next night Hastings called for him. "We're going to try it. Want to be there?" Aiken most certainly did.

The room was darkened. A huge screen stood facing the observers. Elaborate radio equipment was paneled beneath it. An operator stood tense, lightly fingering the control dials.

Between the scientists and the receiving disc, somewhat lower down, was the sending panel with Hastings at the controls. He threw a switch and his body was bathed in a greenish-yellow light.

"I'll focus it at a thousand feet, on Broadway, Jensen," he spoke to the receiving operator. Carefully Jensen adjusted the controls. The screen slowly took color, a hazy mirage drifting with light and shadow. More carefully he adjusted the dials, and suddenly Broadway in all its splendor of night life snapped upon the screen.

"We've got it, fellows, we've got it!" Hastings' exultant shout startled the observers almost as much as the scene before their eyes. But what followed was even more surprising. People in the near foreground stopped, turned and looked upward directly toward what appeared to be the center of the screen. Their faces turned ashen. Some fainted, others fled terror-stricken.

"What the . . . ?" Then comprehension came. Hastings jerked the switch that controlled the peculiar light bathing him and snapped on the ceiling lights.

Somewhat sheepishly he explained. "I forgot that they could see me sitting there in the sky and hear me speak. Naturally they were scared." Turning to Jensen. "Let's try it in the mountains this time, say on Fisher's Peak, just south of Trinidad. Let's see, that's 212 miles from here."

Again the strange light, adjustments by Jensen, and the level plateau of the top of the mountain stood before them. More experiments, at greater and greater distances, brought corresponding success.

But how to profit by it, that was the next question.

"Listen, Hastings." It was Aiken that spoke. "If you could find that valley of the Ingols, we might be able to see what they are doing, and perhaps get an idea."

"Merle, you ought to be a fiction writer. Every worthwhile idea we have had on this deal has come from you. Science may have worked them out, but it has been your imagination that has kept us on the right track. Here goes!"

Turning to Jensen, he gave instructions to pick him up at Lima, Peru, as a starting point and follow the beam back through the mountains.

It was but a few minutes' work to find the image of the distant city, then rapidly the mountains swept across the screen under the guiding hands of Hastings and Jensen. Hundreds of miles of mountainous valleys were swept by the exploring beam, until far in the fastnesses of the upper Andes, lights appeared in a precipitous valley.

Slowly the scene seemed to draw near, as though the witnesses were in a plane hovering above the spot.

Hastings turned a dial that changed the glow flooding him from a greenish yellow to a deep violet. The scene on the screen remained unchanged.

"That change," explained Hastings, "cuts off the power of making myself visible, yet maintains the brilliance of the picture. Let's go down to the ground, Jensen."

AGAIN the scene rose, until those in the room seemed to be standing at the earth level. People passed them, seemed to walk into the screen and step into nothingness in the room. "That fellow must have walked right through me," Hastings' awed voice muttered.

They located and explored the palace; they found the temple of the Sun-God, and there witnessed the horrible sacrifice of one of the maidens.

It was a terrible yet strangely fascinating scene that played before their eyes. The brilliant sunlight, playing over massive masonry and colorful costumes, seemed in contrast to make the scene even more unreal. It appeared a bit of wild imagining that might have thrilled the audience of a movie palace, but blanched the faces of the strong men who in that darkened room were witnessing it. They realized only too well how true it was. They could see the mercifully drug-deadened girl, beautiful even to the eyes of an Anglo-Saxon, and knew what was in store for her. They would have looked away had it been possible, but they could not. They could only grip the arms of their chairs and struggle for breath, as they watched the terrible scene mirrored on the screen.

A great crowd stood about the open area below the temple. Beyond them rose the heavy stonework, faced with a row of squat columns. A line of hieroglyphs, Inca writing, was chiseled across the façade of the building.

"That means 'Atahualpa'—old Inca ruler—killed 200 of his brothers and drank the blood of other royal relatives—thought it was a charm—wanted to wipe out all traces of royalty," one of the scientists explained in an awed whisper.

On a great platform of stone extending out from the middle of the steps leading into the temple, there stood the form of the Ingol chieftain already familiar to the statesmen of the world. His body was bare, the dark skin glistening in the sunlight like polished bronze. A jeweled garment hung from his hips; chains of jewels and gold about his neck. His haughty head was surmounted by a lavishly ornamented headdress, that seemed to increase his height fully three feet.

On each side of the platform sat groups of ceremonial musicians, with their instruments before them—queer drums, with skin stretched over hoops of wood, and some made of a section of a tree hollowed out into a thin cylinder; copper bells, resembling the sleigh bells of the north; rattles made of small shells, gourds and nuts strung together and attached to the ankles and wrists of the players; and cymbal-like instruments of rudimentary form.

Others had wind instruments of reeds in graduated lengths, the reeds held in place by a crosspiece of split cane and lashed with cords of llama wool; cane and bone flutes and whistles of various kinds.

The chieftain raised his hand. Two black hooded priests strode solemnly forward and took their places at each side of the sacrificial stone.

The music started, if it could be called music—a doleful minor tone that gradually grew in volume and wailed upward in a crazy crescendo of sound. It crashed to a climax and stopped. All eyes of the multitude turned toward the narrow passageway down which the staggering maiden was being led. Slowly she mounted the platform and stood while the music again took up its dirge. Mysterious rites were performed over her, then she was led to the stone and laid in place. The priests advanced, stripping their robes and hoods from their bodies, and stood forth naked, their forms horribly caricatured in flaming paint.

They raised their hands in a final pagan prayer to the Sun, then turned again to the fainting girl. One stripped her bosom bare. The other raised on high a glittering golden knife. It hung poised an instant, then started its downward sweep. . . .

The mirror went dark. With a gasping cry Hastings had switched off the power. It was too terrible to watch. The ceiling lights came on, and the men looked at one another with blanched faces, unable to believe what they had witnessed.

Minutes passed while they sat paralyzed by the experience, then with a shudder, Hastings turned again to the instrument board and with a change of adjustments set the screen in operation. But he did not go back to the temple.

They searched the valley and found the plane hangars, with the ships of destruction standing within. Similar to our own planes in outward appearance, yet somehow different, they stood in long lines.

The wings were much shorter and swooped backward more in the form of a hawk's wing on a long dive. They seemed to be connected to the forward end of the fuselage with a flexible joint that permitted the entire wing to serve as elevator and rudder, though the tail also carried a rudder vane much like those we knew, but considerably smaller. The elevator vanes appeared about the regular size.

Propellers were missing. No propulsive means were visible, unless they lay in a series of small tubes about the diameter of a .45 caliber revolver barrel. These tubes were arranged in three sets, the largest number being laid flat along the under surface of the wings, with the openings pointing directly astern. A second set was located in the bottom of the fuselage, opening downward, and the third set, consisting of five tubes, was placed in the nose of each plane, being used apparently as brakes.

Later investigations proved that our original supposition was indeed correct, and that the tubes shot forth a terrible driving charge much on the line of our own rocket-powered machines, save that the Ingols had developed a system of utilizing the breakdown of atomic structures from which to derive their power.

Comparatively little time was spent in the first investigation, for a new danger occurred to Jensen. If it was possible for our scientists to pry into the secrets of the Ingols, it was equally possible, and indeed probable, that the enemy's exploring beam would find the laboratory. Accordingly work was interrupted while a grounded insulating screen was thrown over the building, equipped with movable apertures to permit the outgoing beam to pass, yet which would prevent most of the danger of discovery by the Ingols. Their beam would be effectively insulated and pass into the ground should it strike the building, unless by some chance it happened to touch the exact spot, where the two-foot opening allowed the passage of our own carrier wave.

IT was at this stage of the game that the period of thirty days' grace expired. Representatives of the nations were gathered in conference, awaiting the appearance of the Ingol. It had been decided that, should an extension of time be refused, nothing could be done but acquiesce, for only by seeming to agree could a wholesale slaughter be averted.

Hastings, Jensen, Aiken and a group of the scientists were in the laboratory a few minutes before the international conference was called to order. The instruments were adjusted and focussed on the throne room of the Ingol chieftain.

There they saw a similar equipment to their own. Before the sending apparatus stood the warrior, marching up and down. Presently he stopped and the strange light bathed him also.

A slight change of adjustment and the spectators in the Denver laboratory appeared to be standing behind the chieftain, looking as he did toward the oval receiving screen. On that screen they saw pictured the conference in the Capitol building. They saw the Ingol smile a cynical smile at the harassed expressions on the faces of the diplomats.

The scientists sat silent, listening to the words of the Ingol spoken in his stilted English and to the replies of the President, who served as spokesman for the nations.

"Your answer! Do you choose submission or death?"

"Honorable Ingol, we have considered you and your race among the highest of ancient civilizations," stated the President evasively. "The knowledge of your existence and power comes as a surprise to us. We recognize our inability to cope with your superior knowledge, but there has not yet been time to notify all peoples of the world. We ask for an extension of time for another thirty days, if such should meet with your approval."

The Ingol glanced sharply from one to the other, his glance showing the suspicion he felt. Those in the laboratory saw his image in Ingol-land turn from the screen and look toward his advisors and sub-chieftains. The appearance of the Ingol in the conference room must have been as though he was looking off into the distance, considering the proposition. He nodded his head, apparently in thought. The diplomats looked relieved, but those in the laboratory saw helmeted figures hurriedly rise and leave the chamber, disappearing down a corridor.

The Ingol turned again toward the President. "We shall consider it, but at the first sign of retaliation on your part, death will rain down upon you." The chieftain's screen went dead, and he turned with a cynical smile toward his throne.

"Quick, Jensen, the air field," spoke Hastings. Again the planes came into view rolling slowly into the open under the star-studded sky of that far land. They hesitated a moment as they took formation, then swiftly rose almost vertically with a faintly luminous blast of the power tubes showing beneath and astern of the ships.

"Into the leading plane, Jensen!"

The scene changed and showed the interior of the speeding fighting machine. A half dozen dark-skinned men were swiftly yet surely placing equipment in position. Short mortar-shaped guns of some sort were being trained through openings in the floor. Their breeches were charged with a powdery substance and wire connections made to a control board before which another figure sat watching a multitude of gauges and a reflecting plate equipped with hairlines, which showed him the territory over which they were flying. A duplicate plate before the pilot, coupled with telephonic communication between the two men, enabled instant coordination when in the stress of battle. Control of the plane seemed to be with the operator at the firing board, orders being issued by him to other members of the crew.

On the screen in Denver a tense group watched the flight of the enemy planes. In their own viewing plate they could see the image of the ground beneath the ship, as reflected in the latter's plate. Sweeping steadily north, the plane crossed the vast mountain ranges almost with the speed of sound, it seemed. Soon the Gulf showed below, then presently land again. Hastings announced it must be Texas. The plane, which was the flight leader for the squadron, apparently was taking a direct course for Denver.

As soon as the course was ascertained, Hastings called the President and advised immediate evacuation of the city in as quiet a manner as possible, to prevent needless deaths should the Ingols fail to abide by the agreement.

AN army officer of the anti-craft division of the Field Artillery was a member of the interested audience watching the flight of the enemy planes. To him the next idea of importance came.

It was granted that, even being able to discover the means by which the strange planes were driven, it would still be impossible to construct ships that could meet them in battle within the short length of time left before a definite answer must be given. The world's hope must be pinned on some type of offensive defense, something that apparently was purely for the protection of civilized peoples, yet something that would at the same time strike a telling blow at the heart of the Ingol stronghold.

Distances from the Valley of Yazutak were so great that a land expedition was not feared. Any attack that the Ingols would make would of necessity come from the air, and naturally any defense or offensive movement would have to be made through the air.

"Mr. Hastings," spoke Major Eberling White, "I have an idea, if you can supply your end of it. Can you give me, by watching the interior of that ship there, the course, elevation, and speed that it is making?"

Hastings glanced at the viewing plate. He saw pictured on it the instruments of the pilot, saw that the plane at that time was following a compass course of N-10-W, saw that the speed indicator registered a symbolic figure that was easily translated through timing its flight over known cities into 420 miles an hour, placed its elevation in a third instrument.

"Yes, Major, I can."

"Umm-m-m! Well, Hastings, can you tell me at any given instant just exactly where the plane is in relation to points on a large scale map?"

"Not now, Major, but when it is in familiar territory, where I can place myself in her firing finder, I can give you the exact location."

"I notice, Hastings, that except in actual battle perhaps, the ship seems to hold a fairly even course and speed. It might be possible to compute thirty seconds in advance exactly where she would be. Yes, um-m-m, it most certainly would." The Major seemed to be talking more to himself than to the others.

"That being so, should they fly within range of our new anti-aircraft guns, and keep under 10,000 meters, it would be quite possible to bracket them, and in all probability bring them down. Umm-m-m, quite so."

The Major thought in silence for a moment, while the others watched him anxiously. Quite evidently he had an idea that might prove of vital importance.

"Umm-m-m. I say, Hastings, how long will it be before these planes are over Denver?"

"About an hour and three-quarters, Major. They are in the central part of Texas now."

"Good!" Major White stepped rapidly across to the phone and called his battery. "Send plotters and instruments to the laboratory immediately. Man the guns and upon order fire as per directions from me in groups of four. It will require every ounce of speed you can put into it, for there are five ships and we have 12 guns. Two sets will have to fire twice, all with perfect hits, before they can bring their planes to bear or we shall be wiped out. It is the only chance."

Again the Major called central. "Maintain these lines open to Battery C with absolutely no interference, no matter what the apparent urgency. Major Eberling White speaking. . . . Very good, thank you."

A few minutes later the sound of speeding motorcycles drew near and a moment after a half dozen tense-faced young officers stepped into the room. Tables were quickly arranged under the direction of the Major and instructions given to Hastings to compute the distance apart and form of flight the enemy planes were holding.

"If we can fire within 500 feet, we can bring them down with those new shells. Their explosive range is terrific. . . . Got it, Hastings?"

"Yes, Major. 'V' formation, 80 degree angle, planes spaced 250 feet."

The Major was evidently highly elated. "Good, one battery may bring down more than one plane. Captain Grayson," speaking to the officer in charge of the plotting crew, "you will compute for firing at thirty second intervals. Mr. Hastings will give you the necessary details. There must be no mistake."

"Yes, sir." Captain Grayson turned to the men and apportioned their duties, then to Hastings and got the starting point at which it seemed the planes would enter the extreme range. This was plotted on the map. Major White turned to the phone and gave terse instructions to the firing officer.

"Lieutenant, you will train all guns to one setting, firing them in groups of four at one-third second intervals. Instantly stand by for change in range and on instruction fire again in the same order. Battery firing will be automatic at thirty-second intervals after your first order. Clear? . . . Very good."

FIVE minutes later Hastings informed Captain Grayson that the planes were approaching the range line. He gave the elevation, speed and course. A moment later he gave the line of crossing the predetermined area.

Instantly the five men at the table sprang into feverish activity. Captain Grayson stood tense, holding the phone which the Major had released to him. His eyes on the watch, he spoke swiftly into the transmitter.

"Stand by. Fire in 27 seconds." The plotting officers reported their computations, the captain instantly repeating them into the phone. "Range 92°. Elevation 48° 32′ 21″. Quadrant 176° 27′ 19″. Ready—Fire!"

Simultaneously with his command, men standing at the windows looking toward the location of the batteries saw thin lines of flame shoot heavenward, followed a few moments later by groups of blinding flashes high in the skies. Seconds afterward the reverberations of those rending concussions came to their ears, muffled by distance.

Meanwhile the Captain was again speaking. "Range 3325. Elevation 86° 05′ 52″, spread quadrant five degrees centering 94° 35′." In that thirty seconds the enemy planes had time to travel almost three and a half miles and were now a little east of the batteries and practically directly overhead. Again came the flash of the firing, interrupted by Hastings' excited shout.

"Four of them the first time!" The view had been set back so that the entire group might be seen. "The leader is wobbling. Half a wing is gone. He is coming down, tight spiral to keep right side up. Oh-h-h!" A blinding flash had come from the bottom of the plane, and Hastings realized it meant the firing of the Ingols' deadly guns on the area beneath them. "Captain, he'll land in segment 76-K."

"Hello, firing officer, barrage battery—gas 109—76-K. At will!" The plane had scarcely landed in the area of death before the shells of the barrage began falling. The plane was not struck, though the ground all about it was torn into deep craters. A half dozen shells had landed and members of the crew of the fighting plane could be seen to drop to the ground, unconscious from the effects of the stupefying gas. The Captain ordered "Cease firing" and instructed a detail to enter the area and capture any of the enemy yet living.

The first raid was ended.

The actual capture of the two stupefied men remaining alive after the crash needs little comment. It can be found in detail in the average school history of today. The plane itself, as well as the others of the flight were so wrecked as to be useless for scientific study as to their construction.

THE army men and those others gathered in that darkened room naturally anticipated immediate retribution from the Ingol chieftain, and laid plans accordingly. They could not hope for the same luck on the next invasion, for undoubtedly, to their way of thinking, the flight had been watched, even as they had watched it, and adequate care would be taken to prevent a recurrence of the surprise.

As it turned out, however, the Ingols had not dreamed of a catastrophe of this sort and had no knowledge of the fate their fliers had met. Moreover, they were unable to locate the wreckage under the camouflage and so it was not until several days had elapsed that they became certain that the planes were gone. Even then they were not aware of the means by which the defeat had been brought about.

In the meantime, figuring that a second flight would follow approximately the same course as the first until comparatively near their destination, the army authorities had established their guns much farther to the south, beyond the line at which the Ingol planes would probably begin to change courses should they be suspicious as to what had befallen their earlier companions.

This new location was connected by direct phone lines with the laboratory and arrangements made for duplicating the first victory, should that be at all possible.

Meanwhile, Jensen and Hastings had kept the view plate tuned on the airfield in Ingol-land and had taken turns sleeping so that a full 24-hour watch might be maintained.

It was early on the fourth day, with Jensen on watch, that warning of the second raid came.

The stately Ingol had appeared but once, the evening before, when his form became apparent to the statesmen convened in the conference hall. Reports of those present stated his appearance was terrible to see. He had been visible but a moment and had spoken but few words: "We have received your answer. You shall kneel before my throne and beg for mercy that we shall not grant." Then he was gone.

Immediately evacuation of Denver and the neighboring cities started, and army preparations reached a frenzied pitch. False leads of air activity were apparent everywhere, intended to divert the attention of the Ingols, who, it was known, would be watching.

Meanwhile a third line of defense was being arranged for the extreme southern edge of Texas. This was to remain silent during the next anticipated flight and would be called into action only in case of a third punitive expedition.

Nine enemy planes took off just at sunrise. Their course was closely watched by those in the laboratory and once again unbelievable good fortune came to the American gunners. Seven of the ships were brought down at the first burst. The other two wriggled through but their propelling mechanism was so damaged that they were forced to descend and were captured with the ships in fairly good condition.

Prior to this, crated plane parts for ships of the speediest type were *en route* from San Francisco to the coast of Peru on board a specially chartered and rebuilt tramp steamer. To all appearances this vessel had no connection with the army or navy forces of the Allied Governments, but seemed to be nothing but a wandering, rust-covered and unpainted vagabond of the seas.

Below deck, however, crews of mechanics were hurriedly unpacking and assembling these planes into effective fighting units. Portholes had been shaded and the entire working area screened against the prying ray of the Ingol personality projector, as a safeguard against detection. Forced draft ventilators enabled the men to work in comfort and even tune up the motors so they would instantly be ready to take the air at a signal from the President.

This vessel, which had steamed at full power until near the Canal Zone, was at this time lolling easily through the seas under bare steerage way to prevent the necessity of having to lay over for a suspicious length of time off the Peruvian coast.

A check-up from the laboratory on the Ingol airfield showed five planes only remaining. It was a possibility that others lay hidden somewhere, but Hastings and Jensen thought it unlikely, for every nook and cranny had been thoroughly investigated. Apparently the

Ingols had felt that their ships were invincible, and the comparatively small number already captured, wrecked and in reserve, had constituted their entire fleet.

IMMEDIATELY after the destruction of the second flight of planes, Hastings had ordered the view plate turned on the Ingol palace. There had been no time to check on the activities of the Chieftain during the actual raid, but following the crashes and destruction of the enemy ships, an inspection of the throne and assembly rooms there showed the surprise and consternation with which the unexpected reversal had been received.

An element of fear and uncertainty seemed to be registered on the faces of the leaders. Also there was a fanatical light of almost crazy determination in the eyes of the High Chieftain.

They seemed to fear the risk of losing the balance of their fleet, yet there was no other way by which they might bring the war into the borders of the Allied Nations. They reached their decision shortly after midnight of the day of their second failure.

Those in the laboratory watched the flyers again roll out the planes and make preparations for a third expedition. Warning was sent to the sea tramp rolling idly in the waves fifty miles off shore to stand by. A moment's switch of the view mirror to that point showed the huge hatch being removed and the false superstructure of the after deck being dumped into the sea, which revealed a take-off and landing platform beneath it.

The Ingol planes took to the air, and immediately an order went to the tramp. Their booms speedily lifted the Allies' planes to the deck and one by one they took to the air also, circling about the mother ship until the formations were complete, then headed through the early morning darkness toward the seacoast far to the east.

No one knows what the plans of the Ingol Chieftain were, and there will probably never be any way to learn them now. Evidently he underestimated the resourcefulness of the Allied Nations in establishing undiscovered the third and farthest-flung line of defense, for the Ingol machines again followed the course of the first two flights until the coast of Texas was reached. Perhaps he had ordered those five planes to pick up that well-known landmark, then change their courses to avoid danger. Whatever the orders, the five planes flew unsuspectingly into the danger zone and once again the first salvo from the hidden guns brought the ships to earth, despite the fact that last instant corrections of the elevation had to be made due to a sudden zoom of the man-birds. At the rate they were zooming, another ten seconds would have placed them safely beyond the reach of the Allied guns. But the result remained the same—they were brought down to earth as had been their predecessors.

Immediately this was done, Hastings ordered the Allied planes picked up. They were found just entering the mountain regions back of Lima. Turning his voice into the ship of the flight leader, Hastings gave detailed instructions for the course to be followed until the hidden valley should be reached. The planes were then to circle at 10,000 meters until Hastings again returned with further instructions.

The viewplate was then turned on the Ingol palace and once again found there not only fear but consternation. A great mob of the natives milled about the outer area. The Chieftain and his lieutenants were gazing horror-stricken on the scene of the last crash. Their plate showed the tangled masses of wreckage and the throngs of people circling about them.

Hastings snapped the switch that changed the light flooding him from deep violet to the greenish-yellow, the vibration that made his person visible and his voice audible.

"High Chieftain," he spoke. The group whipped about and gazed awe-stricken at the sudden apparition. "High Chieftain, the time of reckoning has come. I speak on instruction of our President. Your planes are down and it is our turn to demand submission.

"We didn't want this war. You brought it on yourselves. That we have penetrated many of your secrets is our good fortune and your loss. Our war planes are now circling above you. Submit or . . ."

The Chieftain seized a small weapon at his belt, patterned along the principle of the already familiar plane mortars. He fired it pointblank at the figure of Hastings.

The latter involuntarily ducked—the thing was so realistic. Then he suddenly realized the impossibility of being injured and his mocking laugh rang through both the laboratory and the Ingol council chamber.

"Be back in five minutes, Chief," he remarked. Then turning to Jensen. "Back to our planes." They were picked up almost immediately and in the early light of the morning, Hastings gave instructions to bomb the airfield, which was then practically deserted. The planes circled and headed for the hangars beneath them. A moment later three speeding dark objects hurtled downward from the first three ships of the flight. A few seconds later great flashes of light and clouds of smoke and dust welled upward from the area where the hangars had stood.

"Hold it, captain," instructed Hastings. "Back to the Ingols," he said to Jensen.

The scene again changed and once more the watchers saw the group of weirdly clad enemy leaders.

"That's a sample," stated Hastings to the group before him. "What's the answer? Peace or death?" They looked from one to another as the chieftain translated the message for those who could not understand. The High Chieftain suddenly seemed to have lost his proud and haughty bearing and appeared a bent and broken old man. He turned back from his men and made the sign of peace, hands raised with the palms outward.

"Your demands?" His voice quavered as a man suddenly stricken.

"That is up to the Allied Nations. We'll land a representative in one of our planes. Others will continue to circle above you and a single move of treachery will bring about the death of every one of your tribe."

"It is well. He will be received." The Ingol answered.

One of the planes slowly dropped to the airfield and came to rest, the others continuing their guard patrol.

THAT about finished the story. We all know today that peace was established. We know how the wealth of the tribe was placed at the disposal of the world to rehabilitate the places wrecked in the early raids. Today the valuable mines are handled under the direction of the Allied Nations. The Ingols have lost much of their pomp and glory, as always happened to a

conquered people, and the horrible sacrifices to the Sun have been done away with by international mandate.

The scientific discoveries of the Ingols have been made available to the world at large and the nations of the world have placed at the disposal of the Ingols their discoveries. Peace and harmony have finally been reached, which was in reality the aim of the Ingol Chieftain, now long dead, but it was done with a greater mutual benefit than would have been possible under the plan of conquest outlined by him.

But one thread remains to be gathered.

Merle Aiken, the man who made possible the saving of the world through his early researches, and who through his lack of technical knowledge was forced to stand by as a mere onlooker during the later developments, was granted the highest honorary award ever given by the Allied Nations. His bust, sculptured by the famous French artist, Plaisson, holds the place of honor in the International Hall, and his name is recorded in every history of those troublous days.

His own nation, through the President and his cabinet, opened up the Government Laboratories to him and under the expert tutelage of the scientists in charge, gave him the start which made him in later years one of the greatest of all scientists, the man to whom we are indebted today for many of the greatest inventions of the modern world.

Merle Aiken now stands in the mind of every boy and girl as the ultimate model from which to pattern one's life. He is one of the few heroes who will live through the years, not only as a savior of the world but as one of the greatest benefactors in the world of science that has ever been known.

To do good to humanity is the end and aim of science.

THE END

South Polar Beryllium, Limited

By Peter van Dresser

(*Continued from page 427*)

copper beneath. In the meantime Frazer had laid the uninsulated wire along the snow and trampled it under to form a ground—not very efficient, but adequate. Hamilton seized the exposed end of the wire in his mittened hand and touched it to the core of the cable. The contact sparked a little—at least the current was partially grounded and the operators at the station would notice the diminution in intensity. As quickly as possible, with the clumsy keying system, he sent out an S. O. S. and the location: "*Boanerges* in ravine of Blind Canyon six miles south Thunderstone Cut. Men wounded—send help."

He repeated the message, then suddenly remembered the pick-up apparatus in the cabin. If it was still in working order he might be able to receive and answer. There were four minutes left at most before the automatic switches would cut them off. He scrambled up the boarding ladder and into the wrecked control room. A hasty search with the hand lantern revealed the phones hanging by their cord where the skipper had left them. He slipped them on—and the familiar musical buzz sounded in his ears. Even as he listened, it broke off, and commenced slowly to spell out a message in the Morse. "Your signals received . . . section patrol notified and hurrying——"

Click! the cable was dead. Strauber's automatic switches had come into action. But the S.O.S. had gone through, and in an hour or so the light machine of the section patrol would arrive.

As soon as he had notified the rest of his success, Hamilton commenced a rapid search for the plans which had been the cause of all the trouble. He found them, safe in the brief-case near his overturned valise, Strauber had apparently just located it when he heard the roar of the falling cement. But there was no trace of the man himself. Maddened by the failure of his plans, he must have leaped into the darkness and escaped. His tracks were almost immediately obliterated by the drifting snow. After a brief attempt to search for him in the howling inferno of wind and snow which cut their faces and whipped away their voices, Hamilton and the engineer gave up the effort and returned to the warm engine room to wait.

HAMILTON, in an endeavor to understand Strauber's insane dash into the storm and with a curiosity concerning this man whose orbit had crossed his own so briefly—so briefly, in fact, that he had never even seen him—questioned the morose prisoner. From his crude answers he pieced out the melancholy story of a brilliant mind hounded by real and imagined misfortune, till it turned from the practice of science to that of crime. The man was undoubtedly an extreme paranoic, and in his discharge from the services of S. P. B. (Hamilton having filled his position) had seen the culmination of a series of malicious designs on himself. Accordingly he had devoted the last of his energy and resources to this attempt, which would be his revenge against the great mining organization and also the recuperation of his sunken fortunes.

The scheme was cleverly worked out, but it had failed because of the completely unlooked for move on the part of the crew of the *Boanerges*. But for that move, which wrecked the criminals' motor sled, Strauber and his men would be forging their way through the storm to their concealed plane, with the valuable plans of the ionic separator stowed away. His next move would have been, of course, to sell them to International Met. as his own invention.

Well, thought Hamilton, as he leaned against the still warm port oil-feed manifold and listened to the whistling of the wind; at least I am indebted to Strauber for a thrilling story to tell my grandchildren—when these will have become "the good old days."

THE END.

Discussions—

In this department we shall discuss, every month, topics of interest to readers. The editors invite correspondence on all subjects directly or indirectly related to the stories appearing in this magazine. In case a special personal answer is required, a nominal fee of 25c to cover time and postage is required.

SOME GOOD WORDS FOR THE EDITORIAL STAFF

Editor, AMAZING STORIES:

May I offer some diversified observations upon the contents of your February, 1930 issue? It was a chance copy which I found; I believe your magazine is not regularly on sale in this country.

With regard to the Fourth Dimension, your Editorial footnote treats it as purely a mathematical abstraction, which, as far as the ordinary person is concerned, is "for amusement only." A recent review in *Nature* attempted to answer the question of what are the practical uses of multi-dimensional geometry. The review instanced the statistical work of Dr. R. A. Fisher, Chief Statistician at Rothamsted Experimental Station (Harpenden) and author of "Statistical Methods for Research Workers." Dr. Fisher's work is based in many cases upon *n*-dimensional space and the application of statistics to, say, the counting of bacteria upon six parallel plates may be regarded as a re-projection into our three-dimensional space-continuum of a five-dimensional occurrence. If five plates are in question, there are four degrees of freedom, or, in other words, four dimensions. The investigation of garden soil may therefore bring the fourth dimension right to our doors.

After reading your praise of Wesso as a star artist, it was rather a shock to find that such a brilliant illustrator of scientific tales should have the same idea of a bio-chemical laboratory as has the ordinary advertisement artist. The chemical retort and the footed glass may be said to be extinct except in the imagination of such artists, who invariably proceed on the lines that "no laboratory is complete without one." Moreover, the shapes and dispositions they adopt are such as would never be adopted by any chemist. I notice a number of other details, but I do not intend niggling criticisms: I do not ask that Wesso be an expert chemist, for if he were that, he could hardly be an illustrator as well. I do suggest, however, that he might get well ahead of other artists who have these funny notions of retorts. Especially should a scientific artist have a good sense of proportion about his apparatus!

The author of "Into the Valley of Death" is quite right about the toughness of manganese steel, which, until recently, could not be machined. Last July I watched some special trackwork for street-car lines being ground, punched, and drilled at works of the Messrs, Edgar Allen & Co., Ltd., Sheffield, England. These are specialists in manganese steel, but the discovery is so recent that Mr. Pringle is not to be blamed for not having heard of it.

I liked your editorial on *Discs.* Some time ago I wrote an article on a *Hole in a Piece of Paper* which resembled your article in general treatment. In conclusion, may I say that it is evident that the editing of the magazine is in capable hands: the Editor seems well able to curb effectively the juvenilities of some of his correspondents.

Hugh Nicol, M.Sc., A.I.C.,
43 Overtone Road,
Harpenden, Herts, England

(One of the tragedies of the work of our editorial staff has been to get artists to illustrate our stories. If you will watch the work of Mr. Wesso and Mr. Morey, we think you will conclude that we are rather fortunate in finding two such good men. Your statement about manganese steel is interesting. Where trolley cars have to turn at corners of streets and the like, the greatest difficulty was experienced in former times from the way they would wear out the frogs; the friction was so great. At these points now, expensive steel is being used and the passerby can see where it is in use by the different aspect of its surface. It is brighter and lighter in color than the ordinary rail. We are so proud of our "Correspondence Column" that we feel that we add to its gayety in putting in the juvenilities, as you term them, of our correspondents. The letters we put in are generally given in full and with just enough editing to correct the spelling and other similar features.—EDITOR.)

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THE LOCH LOVERN'S MASTS

Editor, AMAZING STORIES:

I have just been reading Mr. Verrill's "Non-Gravitational Vortex" in the June issue. May I write you a letter about it, like any other reader?

Swell story; but what I want to take a poke at is the artless illustration by Morey both on the cover and on the first page of the story. The "Loch Lovern" is represented as a steam yacht (not a very well found one, either, to judge by her bows); while on page 202, near the top you will find the following in Mr. Verrill's story—"To him life began with the hours of his recovery aboard the *Loch Lovern*, Sir Esme's ocean-going yacht, a splendid five-masted bark, for Sir Esme was a true sailor and had no use for steam."

Where, oh where, is the five-master? And on page 207 Sir Esme himself is shown—with his waistcoat buttoning right over left, a thing no man's waistcoat ever does, even in England.

Morey is usually pretty good; I like his pictures better than Paul's, but he pulled a couple of boners this time.

Fletcher Pratt,
182 West 4th Street,
New York City

(We acknowledge with grief, the error about the masts of the *Loch Lovern*. As to the waistcoat buttoning the wrong way, not being in the sartorial profession nor an authority on fashion, we have nothing to say. We are glad that you like Morey. He has been doing some very fine work for us.—EDITOR.)

PLUTO AND MR. HAMILTON. THE FORCE RAY AND REACTION

Editor, AMAZING STORIES:

AMAZING STORIES are great! I began reading them in November, 1928. I was attracted to them because of the cover! That settles the cover question.

I see that there has been a revolution (no bloodshed, but a peaceful one), and it has been for the good of A. S.

Now for the stories.

The January, 1930, issue as a whole was excellent. The best stories were: "When the Atoms Failed," "Fourth Dimensional Space Penetrator," "The Hungry Guinea Pig," "The Sword and the Atopen" and the "First Ornithopter."

In the new May issue, Hamilton makes the mistake of declaring Neptune to be the outermost of the planets in the solar system, because planet X has just been discovered.

Of course——

If the force-ray was emanating from Neptune and striking the sun, wouldn't that tend to push Neptune away from the sun?

The other stories are very good, except "Through the Veil." "The Ivy War" was great! "The Pea Vine Mystery" and "The Dead Sailor" were very interesting. Have some more of those.

In the April issue, Campbell, Jr., throws millions and billions about like baseballs! "One million space-ships lost." "Never mind, we can make a billion in one hour." But it was a swell story. Have some more by him. And don't forget Julian Kendig, Jr., either. A sequel to his "Fourth Dimensional Space Penetrator," and hurry up about it.

Hurrah for "Skylark Three!"

K. Davis,
104-55 120th St.,
Richmond Hill, N. Y.

(Pluto, which is the name for Planet X, had not been discovered when Mr. Hamilton wrote his story. We are very glad you like Mr. Campbell's work, as we regard him as a great accession to the ranks of writers on fictional science. The force ray was counteracted by a second force ray in the opposite direction in the story you refer to.—EDITOR.)

THE YEAR OF THE PLANETARY ELECTRON

Editor, AMAZING STORIES:

In the story "When the Atoms Failed," by John W. Campbell, Jr., it tells of destroying matter entirely setting powder loose. If material is composed of one system of Sun and Planets interlocking into another system of Sun and Planets their atoms doing the same and so on getting smaller and smaller it would be impossible to set loose a measurable amount of energy from a quantity of matter.

In the story of "The Fourth Dimensional Space Penetrator" it tells of the electron of the hydrogen atom going around the nucleus at fifteen times a second. I don't believe, if it were possible to see our solar system reduced that much, that any

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of the planets, even Mercury, would travel that fast. Another thing is the sable lights which illuminated the atoms. I understand that in high-powered microscopes, the object must be illuminated by violet or ultra-violet light, because of the length of the waves of light. Otherwise, I cannot find anything wrong with the stories now; but I wish there were more interplanetary stories and not always finding human beings or something very much like us living on the planet being explored.

William Schafer,
426 Taylor Avenue,
Camden, N. J.

(The radius of the orbit of the theoretical planetary electron is so small that if you will, by the rule of ratio and proportion, reduce the year of the planet to what we may call the year of an electron, you will be astonished at what a small duration it will have.—EDITOR.)

A SEVERE CRITIC WHO SEEMS TO FORGET OUR OFFICE IS TO PLEASE A GOOD MANY THOUSANDS

Editor, AMAZING STORIES:

The June issue was the worst you have put out yet. It was absolutely terrible. I certainly do not see anything in A. H. Verrill. He isn't much good. He's too much inclined for wordiness as is H. G. Wells. "Piracy Preferred" was no good on account of too many explanations. That ruined the whole man and his works. I hope you won't have any more stories by these authors.

I'm glad to see David A. Speaker in the next issue. Hold on to him. Say! Ray Cummings, Murray Leinster, Victor Rousseau, and other old-timers are writing for a new magazine on the stands. If the new magazine has stories by them, why, my editor, can't we? Also this new magazine does not cost as much and has stories by the old timers! Then why can't we?

What has become of Harl Vincent? He always wrote well. What has become of A. Merritt? He was another old master.

And when do we get the *Promised Sequel* to "The Face in the Abyss"? And when do we get a sequel to "The Moon Strollers"? And how about going through space with the characters of the most marvelous "The Green Girl"? And how about some more by R. F. Starzl? His "Madness of the Dust" was great. Also I haven't seen anything of Victor Rousseau at all since I have been reading A. S. Why don't we get something by this popular author?

Another author that I agree with your readers is no good is Dr., * * * * * He simply does not know how to make an interesting story with a good plot to it. Nothing you say can change that because it is the truth.

If you won't give us something by the old timers, you can at least reprint some of their stories as: "The Moon Pool," "The Face in the Abyss," "People of the Pit" by A. Merritt; "Tarrano, the Conqueror," "The Man on the Meteor," "Around the Universe" by Ray Cummings. How about it? "Mad Planet" and "Red Dust" by Murray Leinster. Or why not reprint his stories from the "Argosy"; "The Darkness on Fifth Avenue," "The City of the Blind," "The Storm That Had To Be Stopped." As the last two are sequels to the first, why not reprint them in three consecutive issues?

With my best and heartiest wishes for the future success of AMAZING STORIES, I am

Gabriel Kirschner,
Box 301, Temple, Texas.

(Mr. Verrill, whom you do not like, is one of the highest authorities on Etomology and Archaeology and if you will look at his biography in "Who's Who in America" you will find nearly fifty books credited to him. In addition to a number of magazine and scientific journal articles. He appears in the June issue. "Piracy Preferred" is by a newer author, who is rapidly winning a name for himself. Harl Vincent is still with us and we shall soon give you a story by him. We absolutely disagree with you about Dr. Keller's work. He is a highly educated specialist and has the knack of giving the much desired unexpected and impressive end to his stories. For a good ending we suggest you read "The Flying Threat." You will not know how it is ending until you get to the last few sentences, when all is cleared up in a few words. We wish you to read some of the letters following this one, so that you will see that the work of the authors whom you seem not to care for are in demand by many of our readers. But thank you for your good wishes.—EDITOR.)

ACTION AND REACTION—THE ROCKET IN A VACUUM AND IN AIR

Editor, AMAZING STORIES:

Although your stories are fiction and meant to entertain and not to teach, it is not a good idea to let your authors implant erroneous ideas in the brains of the coming generation of scientists, our protegés. Not only might they dream many dreams founded on principles unsubstantiated set forth in your publication—dreams are often the conception of invention—but they might also work on a theory based on such a fact (?).

An example of what I am attempting to delineate is that principle of rocket ships, etc., which requires, or at least is aided by, the pressure of the released gases on a semi-stationary object, in order to attain the forward motion so essential to its progress.

The forward motion is obtained in a rocket ship, it is true, by the expulsion of gases, but its explanation depends not on the above principle, with all due apologies to the promulgators of that most honored idea, but upon the word and mathematics of a scientist of some few decades ago. His name was Isaac Newton and the words he used to explain the rocket vehicle's action were, "action and reaction are equal and opposite." Perhaps you have not heard of this man. It is true, much of his works are obscure to many people; and since the repeal of the Law of Gravitation, attributed to Einstein, a popular modern, who however, only added a "rider" to the bill, Newton has been more obscured than ever.

Back to the former subject and a comparison. Action and reaction are equal and opposite. What happens to the cannon ball after it is shot from the cannon does not affect the recoil of the cannon in any way; whether it is shot against a wall five feet away or on Paris 75 miles away. Likewise a fireman holding the nozzle of a hose with a stiff stream of water issuing from same does not feel more pressure from it when he holds it against a stone wall than when he sprays a bed of flowers with the same stream.

These two parallels might tend to help the fact trickle into the minds of some of your authors, only some I say, and some of your arid correspondents, one might say arid, that your rocket and ray machines cannot be helped on their journey by what their propelling force strikes after it has left the machine. That is a rather broad statement, however, and one might well invent a reflective impulse that worked both ways for a story.

Your stories again are chosen to entertain. Rarely do they show clear presentation of ideas in idiomatic English. A command of the language is perhaps not necessary in these days, but it is still a graceful asset to any writer. In literature this has often been called a sterile age. Such a period is usually referred to as decadent. Aside from the school of biographers at present it is a sterile age. And biography of all constructive literature comes closest to the sterile. But pardon the digression on such an unimportant subject, no one pays any attention to it nowadays.

Doan Oxlla,
(One of the charter members S. C. C.)
2 Beck Hall, Cambridge, Mass.

(A rocket would go better in a vacuum than in the air and the air has nothing to do whatever with pushing it forward. We thought that our readers had been told this a number of times. We are inclined to agree with what you say about this being a sterile age and that sometimes the trouble with modern biographies seems to be that they are perhaps too picturesque. But the work of such authors as Strachey and Maurois are very good reading. Ludvig, it sometimes seems to the writer, goes too far in striving for picturesqueness. Perhaps our sterile age might be called "The Age of Biographies and of Best Sellers."—EDITOR.)

A COMFORTING LETTER FOR THE EDITORS

Editor, AMAZING STORIES:

I have just finished reading the June number and it, like all the rest, conforms to the same high standards set by all that leaves the presses of the Experimenter Publications, Inc!

It has only been a short time since I first began reading AMAZING STORIES and I am afraid I have not been as constant a reader as I should, and that is the reason I am enclosing your subscription coupon which will assure me of two years of good entertaining reading, with enough truth and scientific facts to make such reading a veritable gold mine of information to one who cannot be an experimenter, yet who wishes to keep abreast of the march of scientific progress.

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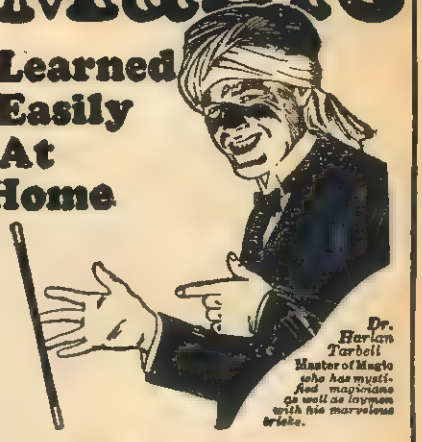

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Then too, I am enabled to have the possession of a collection of the works of an author who has made for himself an enviable reputation as a writer of scientifiction.

And now to throw my hat into the ring:

I have been intensely interested in the discussions anent the nullification of gravity. I for one do not agree with the theory that has been advanced that by the use of a gravity screen namely, that after the elapse of a certain period of time all the Earth's atmosphere would be thrown off into space.

Air has the uncanny property of being able to adapt itself to almost any condition and furthermore it is not affected by any of the contrivances in continual use, viz., radio, telegraphy, airplanes, etc.

Then too it has the ability of replenishing itself apparently without the use of any outside agency, maintaining a constant pressure no matter how many oxygen-consuming elements may be operating at a given time in a given space.

And also, air evidently is not attracted by gravitation, for if it were the atmospheric band would have hardly any height and the pressure at the surface of the earth would be enormous.

Under such conditions, therefore, the air above any gravity screen would be as unaffected as a human hand resting on the asbestos covering of a furnace running full blast!

Contrary to most contributors to the writers' column, I wish to say that of all the stories in your magazine I have read I have yet to read one that wasn't entertaining clear through.

Of course, some stories stand out above others and among these I list "The Non-Gravitational Vortex," which gives the most plausible explanation yet of the disappearance of Nungesser and Coli. "Piracy Preferred" is the type of story that strikes me as being just right.

Let's have more like "After 12,000 Years," "The Undersea Tube," and "A Baby on Neptune."

Roland L. Hansen,
1330 Mohawk Street, Los Angeles, Calif.

(We think you are substantially right in some of your views, but air is attracted by gravitation. Without gravitation the earth would soon be deprived of its atmosphere. The author of "Piracy Preferred," while a scientist of high order, is able to unbend for popular-story writing. Without being dry or pedagogical, his stories are very instructive. The disappearance of Nungesser and Coli is one of those sad mysteries which bids fair to remain a mystery for many years. It probably will never be solved. It is certainly a compliment to AMAZING STORIES to have a high school teacher speak of it as your friend did. Mr. Campbell will, we hope, continue to write for us for many years. As regards the ocean-going yacht, we have to succumb. She should have had five masts. There is science in "The Feathered Detective" in the division of ornithology.—EDITOR.)

PRESENT KNOWLEDGE IS NOT COMPLETE KNOWLEDGE

Editor, AMAZING STORIES:

I have been reading your monthly and quarterly magazines for a long time. I have seen but one story, "The White Army," that rates mention in the whole of the time that I have read the magazines, but you are not to be condemned severely for that, as the percentage of good stories in your recently brought-out competitors is equally low.

Is it not possible for scientifiction to be written that does not flatly contradict some things that are definitely established scientifically? Or that do not follow one of but two or three general patterns so closely as to give the reader an uncanny feeling of having read that very story before; or that the author does not "invent" some implement in the future that we have already; or that does not endow with existence pure mathematical concepts? (4th, 5th, etc., dimensions.)

It is common for gravity screens or nullifiers to be employed in the stories, yet such things are absolutely contrary to present knowledge. Even repulsive matter or substances are spoken of.

Scientifiction may be classed as follows, with the stories in each group monotonously alike: Interplanetary, sub-atomic, historical (Mayer and Authern) and biological, and fourth-dimensional. As a class, the biological stories are the least answerable to this criticism, and the interplanetary stories the worst offenders.

In nearly every type of story some machine, or some force which we now have is "invented" and given powers which would, to say the least, surprise those most familiar with it. As a shining example of this witness, in "Explorers of Callisto," the paralyzing of human beings, and inducing a fever at a distance by the use of the radiations

of a radio frequency alternator tuned to about a million cycles a second! A million cycles is a thousand kilocycles or 300 meters, and the wave length of a radio broadcast station! Such effects as are mentioned in the story are not properties of such frequencies but occur only at the immensely higher frequencies at about 56 million cycles or near a wavelength of but 5 meters! The error was one of definite statement when vagueness or a determination of facts by the author would have been better.

As to the illustrations in your magazine, why must bodies be shown falling toward the bottom of the picture when the attracting body is shown to one side?

I hope you do not think me a crank but I have been reading this type of literature so long, I have become critical in the extreme, and though the general tone of this letter is at best negative, yet do not get the impression that I don't like AMAZING STORIES, for I would not write this if I did not.

G. W. Bolitho,
381 Bailey Avenue,
Mountain View, Calif.

(If we were to restrict our stories to topics of present knowledge, it would be unfortunate for our readers and for our magazine. It is not impossible that some of the impossibilities which our authors use may become "present knowledge" in the near future. We shall hope to get the views of the author of the "Explorers of Callisto" upon your letter. He is an engineer on the staff of one of the great engineering companies of the world.—EDITOR.)

METEOR SHOWERS; CORRESPONDENTS ASKED FOR BY AN ASTRONOMER

Editor, AMAZING STORIES:

As a student of astronomy, I am very pleased to say that I find entertaining diversion, entertainment, and worth-while facts from astronomical and interplanetary stories, which appear regularly in your magazine, but above all—entertainment.

Among the more recent of this type, Verrill's noteworthy "Non-Gravitational Vortex," should be mentioned. Verrill has a way of making a story life-like and at the same time well saturated with scientific facts. It is a strange fact that two days after I read the above mentioned story a tornado tore its way a few miles north of here, causing widespread damage. This recalls to mind Verrill's statement about vortices being caused by intelligences on other planets. Evidently some individual intelligence stationed on some one of our far-flung nine planets, deemed it amusing to toss one of these vortices in my direction, just by way of letting me know that such did exist! His aim, however, was rather poor!

Well, enough of such piffle. I shall immediately "get down to brass tacks," and outline my reason for writing.

Interested as I am in amateur astronomy, I would like very much to get in touch with others of a kindred interest and correspond regularly with them, especially in the line of meteoric astronomy and auroral and zodiacal light observations.

There must be in this wide world, hundreds, if not thousands of persons interested in astronomy and anxious to do something for science in this line. If said persons would drop me a line or report any meteors or auroræ which they have observed, casually or otherwise, I would be very thankful. Also, I am as much interested in corresponding with persons who watch regularly for meteor showers, and who have obtained data on the subject.

The following are important showers which give many meteors an hour. These are all to be seen in the eastern sky:

Delat Aquarids, July 26-31, inclusive; Perseids (fine annual shower). Aug. 1-15, inclusive. Orionoids, October 16-24 inclusive (seen only after midnight). Lenoids, Nov. 9-16 inclusive (after midnight only), and the Geminids of Dec. 9-14 inclusive, complete the important meteoric displays for the current year, on which I would be more than glad to hear from as many persons situated at widely separated points as possible, and if there are any amateur astronomers in my own vicinity, I should be only too glad to assist them in getting started. Of the above dates, July 29th, Aug. 11th, Oct. 21st, Nov. 15th-16th, and Dec. 12th, are those on which most meteors will be seen, and reports pertaining to hourly rates of all meteors seen are most valuable, as they give us an idea as to the relative thickness and orbits of these meteor swarms. We know, for instance, that the Perseid stream must be very thick, for it takes the Earth between fifteen and twenty days to get through it, varying at different years, depending on the thickness of the swarm at that place, and by investigation into the hourly rate we find the thickness at all points of the stream, consequently the more observations we have, the better.

The Perseids will unfortunately be somewhat spoiled by bright moonlight this year, but I will be very glad to receive observations from anyone interested, on any night of the year.

In observing the exact time of beginning observations and ending should be noted, and observations of under one hour are of little value; two to four hour stands are preferable, and an account of the condition of the sky should be noted, such as—"Clouds passing through Ursa Major and Draco, 9:18-9:37," or "Haze interfering at times," etc. This is essential if we are to gauge the hourly rate accurately, and if the sky is hazy or even partly cloudly, or with more than a half-moon, observations are inadvisable, as so few are seen.

If the observer is familiar with the constellations, the path of the meteor, if well-seen, should be noted, such as—"From half a degree above Alpha Tauri to a point midway between Mu and Nu Tauri," and on a blank, the color, brightness, color of train (if any), and duration, and other interesting peculiarities such as a train of sparks or a two-headed meteor, etc.

As to the brightness or magnitude of a meteor or fireball, the full moon is reckoned at 12.5, the half-moon 6, Venus 4, Jupiter 3, Sirius 2, and two magnitudes down the scale, Voga and Capella are reckoned at about 0.0, Aldebaran, Alpha Cygni, and Antares at 1, and the stars in the Orion Belt at 2. From this standard scale, the reader may continue on down for himself. The 6th magnitude is the absolute limit of naked-eye vision, and the average meteor is 3rd or 4th magnitude, while beginners invariably overestimate brightness and duration both. The average meteor exists about half a second, although different showers average differently. The August Perseids often leave trains for 3 to 5 seconds.

Bert C. Darling, A.M.S.,
1809 Osborn Road,
Lansing, Mich.

(We are very glad to publish your very interesting communication which will be welcomed by so many of our readers. We would suggest the Correspondence Club to you, as a source for correspondents, for many of the members are interested in astronomy. From time to time, we publish correspondence referring to work which its members are doing.—EDITOR.)

THE PROTON, ELECTRON AND THE ATOM

Editor, AMAZING STORIES:

Ever since the change of editors, I have been an ardent pursuer of AMAZING STORIES. It is undoubtedly the best magazine of its type issued.

In the May issue all of the stories were good. "Madness of the Dust," by R. F. Starzl, ranked far above the others. Besides being cleverly written, it had an interesting plot which seemed to flow along of its own accord.

I certainly approve of a large number of artists, since it gives one a variety of different types of drawing. Of all the artists I consider Wesso and Morey the best.

I have never understood the relation between the atom, electron, and proton. I would be very grateful if you would explain it.

I would also be grateful if any reader having back numbers of the AMAZING STORIES which he would like to sell, would write to me.

Tom Roy Dratzek,
14628 Shaw Ave.
E. Cleveland, Ohio.

(The atom has been theorized about for many centuries. The electron is supposed to be the smallest quantity of negative electricity that can exist. The proton is supposed to be the smallest quantity of positive electricity that can exist. It follows that the protons and electrons have the highest affinity and attraction for each other. The atom is supposed to consist of a nucleus built up of protons, generally with a definite number of electrons bound into it; these are called the bound electrons. And outside of the nucleus there are other electrons which have been called the planetary electrons and these, until recently, were taken as acting like little planets, moving in definite orbits, inconceivably minute, of course, rotating about the nucleus. This view has been slightly modified of late by the conception of the Schroedinger atom.—EDITOR.)

"Don't tell me you never had a chance!

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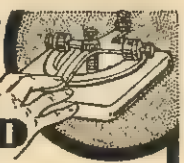

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A READER WHO HAS A COMPLETE SET OF AMAZING STORIES GIVES US HIS VIEWS

Editor, AMAZING STORIES:

I have, on file, every copy of AMAZING STORIES published thus far which, I believe, ought to entitle me to send you my suggestions on improving, etc., a magazine which can't be surpassed anywhere at any price.

In the first place I would like to ask you to use the sort of paper you used about a year ago. In my opinion, which is worth absolutely nothing, I believe that the old paper used at about the time the "Invisible Man" (one of Wells' stories) was published, was far superior to that in use now. However, that is not of the first importance. If AMAZING STORIES were published on wrapping paper, it would make not the slightest difference to me; I'd buy it and like it, too.

One thing I *would* like to have you change, though, is your habit of publishing novelettes (stories of two-issue length) as serials. Why can't you publish them complete in one issue, as "Death From the Skies" was? If that would take too much space, you could save them for the QUARTERLY. If you desire to publish serials, and publishing serials is a thing no editor can resist, why don't you print complete books? Serials should be books, anyhow. All the three-issue stories were most excellent, for example, "The Moon Pool," "The Skylark of Space," etc.

Another thing under discussion is your staff of artists, and their drawings. Above all stands Wesso, artist supreme. Even the great Paul himself cannot hope to rival Wesso. Wesso has a wonderful imagination. His drawings of "The Man From Space" in the current issue show that. He also knows his scientific instruments, as shown by his illustrations for "A Baby on Neptune" and others. And, boy! how that man can draw!!! His human beings *are* human, too. As for shadings and the like, just take a glimpse at the QUARTERLY's pictures for "The Other Side of the Moon." What a combination: imagination, remarkable ability to draw, and a knowledge of scientific instruments. What other quality need a scientific artist possess? I am exceedingly sorry, not to say alarmed, at seeing only two stories illustrated by Wesso in the present issue. The cover is also by another artist. By the way, the artist who drew the cover for the February issue (Morey) is Wesso's biggest threat. He is no mean illustrator, but he can in no way rival Wesso. I can't say that I care much for the other artists, namely, McKay, Wallitt, Bob Dean, etc., but Anderson (he drew the picture for "The Ice Man") is pretty fair. But *please* have Wesso draw the cover and the pictures for nearly, if not all, the stories, with Morey as second best.

I also favor Wesso's method of having several pictures for each story, instead of only one, as the rest do.

Also, why don't you organize a good reprint department? At least for a few serials a year? By a reprint department, I mean for you to have a coupon on which it states: Vote for your favorite story. On this ballot place a list of the best stories of scientifiction that you have ever read—THAT HAVE NOT BEEN PUBLISHED IN THIS MAGAZINE, and which you would enjoy re-reading—in order of preference. On the line below, place a check against the name of the story you think would be best to reprint.

I am positive your readers have a long list of favorites they would like to read once more. I know I have. Besides, whether a story is new or not, if it is good, the readers will like it; and if a large number of readers wish to re-read a story, why, it *must* be good.

A. W. Bernal,
1574 E. 32d St., Oakland, Calif.

(This letter from one of our old time friends is so suggestive that we feel that the best use we can make of it is to file it away in our minds and use some of the suggestions as circumstances permit. It is said that comparisons are odious, but when we say that we consider Wesso and Morey about the best artists we've ever had on AMAZING STORIES, we do not agree that such a comparison would be odious. Of course, we thoroughly agree with what you say. We find that artists are uncertain and temperamental people to deal with. Bob Dean has been very severely criticized by our readers, but his temperament leans to the humorous in a high degree, and in that type of illustration, he excels. If you could see the number of really good stories that we receive from contributors, you would realize that 90 pages gives little room for reprints, and certainly many of our readers have complained about many of the reprints which we have given them in the past.—EDITOR.)

APPRECIATION OF ONE OF OUR AUTHORS. NOTES IN PHYSICAL AND CHEMICAL SCIENCE

Editor, AMAZING STORIES:

I have just finished reading my January copy of the AMAZING STORIES and wish to compliment you on the discovery of a splendid new author. Although you say he is a young man, it seems almost incredible that this can be really the work of a mere beginner. His science is really brilliant and every one with whom I have spoken after having read it has said the same. I suppose that may be some of your readers will miss the love interest which is so conspicuous by its absence, but I think it's about perfect as a science story alone.

I sincerely hope that Mr. Campbell will not stop at this one success, but will give us more and more. The illustrations were good but did not always follow the written description, regarding shape and size of the ship, for instance. I have always been a great admirer of Dr. Keller, but it seems to me that he is not as good as he used to be. "The Corpse That Lived" would not seem to belong in AMAZING STORIES as much as in some other magazine. "The Fourth Dimensional Space-Penetrator" was excellent. There are some faults in the science, however—light, X-rays or cosmic rays always travel 186,000 miles per second! There is nothing relative about that. Also no elemental gas can be explosive—as Mr. Kendig claims for Polerictic Gas. The atom may be explosive as in the element niton, but the gas as a whole can not be explosive. Due to the necessary configuration for stability of atomic structure there can be no element between those we know. It is impossible.

A. Hyatt Verrill is no doubt a famous botanist and archeologist, but please tell him to refrain from physics. I am afraid he is sadly lacking, although I admire his style immensely.

All in all I think your magazine is getting better each copy, and if we can have more stories each time with the assurance of exact science and not merely fiction-science, it will certainly rise in the opinion of many of us. We like our science, but off the griddle of truth.

Mrs. James Middleton,
433 Lincton Ave., Orange, N. J.

(Seriously speaking, it is a matter of pure surmise how soon some new theory of the constitution of the atoms will be involved. Perhaps even the mystic No. 92 will be changed. But we do not want to indulge in scientific heresy in these comments, although it is fair to say that this type of unbelief has done a great deal to develop modern science. If an atom is explosive, why should not a gas composed of such atoms, joined perhaps in pairs as molecules, be explosive? There is so much to learn about atoms and molecules that we cannot take it as certain that they are exactly what the present theory makes them. The theory of the structures of the atom has been materially changed within a very short period and may be changed more. Your criticism, however, is very interesting. Dr. Keller's new stories, which we have scheduled for early publication, you will find are quite clever. He is one of our best authors.—EDITOR.)

AN ENGLISH READER OBJECTS TO REPRINTS WHICH ARE OFTEN REQUESTED BY OUR CORRESPONDENTS

Editor, AMAZING STORIES:

It is hardly the "done thing" to rush off into letters to the editor on this side of the pond, but I feel I must send you a line of congratulation.

I enjoy reading your publication immensely. It's the only magazine one can buy of its type here. Unfortunately, it is extremely difficult to get it here, only one or two shops keep it. I do not suggest you alter its name—far from it, but must admit that many people mix it up with such magazines as *Breezy Stories, Snappy Stories,* and most of which have a slightly questionable reputation this side.

Now as for the stories you publish—why, Oh why, must you waste pages and pages of good space on Jules Verne's "Desert of Ice?" This can be bought anywhere for a few coppers, two shillings at the outside! Then when one has to wait a whole month for your precious 96 pages and pay one and sixpence for them, 20 to 30 pages are spent hashing up 50-year-old scientifiction.

Personally, I enjoy your mechanical, interplanetary and futuristic stories, such as "Menace from Mars." Your Biological Stories leave me cold, especially in view of the fact that that particular subject is a study of mine.

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to edit a magazine especially for me; I realize you have a large and many-minded public to cater for.

I have just got your October copy and am looking forward to a lot of reading tonight. Have you any dealers in London who handle the Quarterly? I can't seem to put my finger on one.

Well, Sir, in closing I'll just say I thoroughly admire your production in every way and can find no fault worth the ink in mentioning.

G. J. S.
62 Basinghall St.,
London, Eng.

(We are delighted to get letters from England and there seems to be a gradual increase of them, which increase we hope will continue. It is said that it would take six lives to see England. We wonder if it will take six lives to get AMAZING STORIES available for easy purchase there. Jules Verne's "Desert of Ice" is not so accessible here and in our desire to please everybody we do give reprints, which some readers object to. You take the point exactly when you say we have a many-minded public to cater for. Your letter is so pleasant and appreciated that we publish it though you have not signed it. All letters published in these columns are supposed to bear the names of the writers. Letters will not be published, if the writers ask the editor not to do so. For copies of AMAZING STORIES address: Rolls House Publishing Co., Rolls House, Breams Bldg., London, E C 4, England.—EDITOR.)

A VERY VIVID LETTER FROM A CORRESPONDENT WHO LIKES TO WRITE TO US

Editor, AMAZING STORIES:

If there is one thing I like to do, it's writing to you. I'm writing this letter chiefly to comment on your December, 1929, issue. Let's go!

"Vampires of the Desert"—Verrill. A nice, interesting story, but I didn't like it half as much as "Into the Green Prism" or "The Bridge of Light." But, like all of Verrill's stories, it's *different*. So-so.

"A Baby on Neptune"—Harris and Dr. Breuer. Fine. A good old interplanetary tale—of strange races and adventures on distant worlds. More stories by these two.

"The Colloidal Nemesis"—Vincent. Of course this has to be good. Look whom it's by. I declare, I don't believe Harl Vincent could write a bad story. His "Microcosmic Buccaneers" was a masterpiece! By the way, this is the first story by him that had no love in it.

"The Time Deflector"—Remember, Mr. Editor, speaking of humorous stories, if you want to get a *good* laugh, compare those foolish "Hick's" things with "The Time Deflector." Boy, Edward can sure write a humorous scientific tale! Talk about funny! I certainly enjoyed "The Time Deflector."

"The Twenty-First Century Limited"—Slachta. This tale was pretty good, but nothing out of the ordinary. I think it was rather weak. A plot, yes, but not handled correctly. Middle class, Mr. Slachta.

"The Secret Kingdom"—Kline Company. Great! Wonderful! Cheers to the nth degree for the Kline brothers! Come on Science fans! Give 'em a big hand!

"A Letter of the Twenty-fourth Century"—Stone—a neat, little sketch, enjoyable, light reading.

Now, Mr. Editor, "The Other Side of the Moon," by Edmond Hamilton, was wonderful. I said that "The Secret Kingdom" was the best in the monthly. *This* is best of all. I'd say more, but I can't find suitable words to praise Hamilton's story. *He is a genius!!!*

Robert A. Ward,
544 East 38th St., Baltimore, Md.

(Your breezy letter is quite delightful. We feel, however, as if we should cease publishing so many commendatory letters. It is really surprising how few of the other class reach us, so we are screwing up our courage, if any really critical letter comes, to publish it in its entirety and perhaps if necessary, humble ourselves before the critical writer.—EDITOR.)

THE ASTRONOMY OF VENUS AND KELLOS IN "VENUS LIBERATED"

Editor, AMAZING STORIES:

In the January issue of the AMAZING STORIES, you were kind enough to publish one of my letters to our magazine. I objected to the astronomy of Harl Vincent as regarding the orbital stability of Kellos, the satellite of Venus in his story, "Venus

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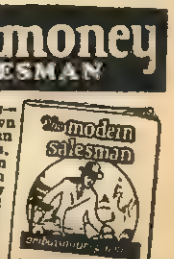

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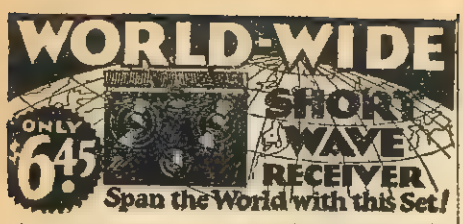

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Liberated." In your comment, you said that you thought it was stable enough, and I have received a great many letters on the subject; many more than I could hope to answer, from the readers. I now wish to give you the reasoning on which I base my assumption.

A satellite at the distance of a million miles from Venus would be attracted by the sun with a force over ninety times as great as the pull that Venus exerts. This may easily be seen by applying Newton's law of gravitation that the force is proportional to the mass, and inversely as the square of the distance. The mass of the sun is about 410,000 times that of Venus and the nearest distance from the sun to the satellite would be about 66 times the distance from Kellos to Venus. Therefore,

$$\text{Sun's attraction on Kellos} = \frac{410{,}000}{66^2} \text{ times Venus' attraction,}$$

which equals a little over 94 times.

However, this alone does not prove that the satellite would leave Venus. That condition may be illustrated by considering the case of the moon and the earth and sun. The mass of the sun is about 332,000 times that of the earth, and its distance is about 390 times that from the earth to the moon, which gives

$$\frac{332{,}000}{390^2} \text{ or a little over two.}$$

Therefore, the sun attracts the moon with a force over twice as great as the earth's attraction, yet the moon does not leave the earth to revolve around the sun. If the earth could be stopped in its orbit and remain fixed, the sun would pull the moon away, but both the earth and the moon are free to move and they revolve around the sun as a system, not as isolated bodies. In other words, it is the center of the earth-moon system that revolves around the sun once a year in an elliptical orbit, while both the center of the earth and the center of the moon revolve once a month around the same system. This center of mass is situated on a line between the two centers, and lies about one thousand miles below the surface of the earth on the side toward the moon.

To find the effective force tending to pull the moon away to the sun, we must take the difference in the acceleration produced on both the earth and moon when the moon is on the side nearest the sun at new moon. At that time, the sun is pulling both the earth and the moon, but the acceleration on the moon, force divided by the moon's mass is greater than the acceleration on the earth because the moon is nearer the sun than the earth is. It is this difference in acceleration that measures the effective attraction of the sun on the moon tending to pull it away from the earth, and that quantity is quite small compared to the attraction of the earth, which has to be overcome.

The same conditions, of course, may be applied to the case of the hypothetical satellite of Venus at a distance of a million miles. On the side nearest to the sun it would be about sixty-six million miles distant, and Venus would be about sixty-seven million miles. The relative acceleration would then be,

Sun on Satellite $= 67^2$ or approximately 4489
Sun on Venus $= 66^2$ or approximately 4356

Therefore $\frac{1}{43}$ is the proportional part of the sun's attraction on the satellite tending to pull it away from Venus. As this is much greater than $\frac{1}{94}$ which is Venus' attraction on Kellos in terms of the sun's, previously found, it seems that Kellos is unstable and would not last a single revolution as I stated in my previous letter.

I hope that you will publish this letter as part answer to those who wrote me and whom I was unable to answer.

Barbara Baldwin,
566 College Ave., S.E., Grand Rapids, Mich.

(We are very glad to publish your interesting letter. Perhaps Harl Vincent will have something to say about this in our next issue.—EDITOR.)

SOME MERITED (?) CRITICISMS

Editor, AMAZING STORIES:

I haven't missed a copy of your magazine yet, either monthly or quarterly.

First: I will throw a few "brick-bats." Your illustrations are awful since Paul has quit drawing them, especially those of "The Secret Kingdom."

Secondly: Your stories are getting worse. For example "The Secret Kingdom." I have read the first two instalments and as yet see no great amount of science in it. It is a good story all right, but has no place in "our Magazine."

I would like to see more interplanetary stories and more by H. G. Wells, he being my favorite author. I will submit a list of what I think are the ten best stories printed so far. I am just

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making the ten without trying to arrange them in any order because it is too difficult:

1, Venus Liberated; 2, The Second Deluge; 3, The Sixth Glacier; 4, The War of the Worlds; 5, The Moon Pool; 6, The Time Machine; 7, Barton's Island; 8, The Master of the World; 9, The English at the North Pole; 10, The Skylark of Space.

"Into the Green Prism" and "Out of the Void" are also very good and deserve a great deal of credit.

I would like to see some comparison sheets of other "old-timers" because, undoubtedly, I have forgotten several old stories which the names will bring back to memory. If this letter gets into the "Waste-basket" or doesn't, I expect to write again and offer some criticisms, but don't want to take any more of your space this time.

James H. Hicks,
429 47th St., Brooklyn, N. Y.

(There is no doubt that it does one good to get severe criticisms. You will frequently find that our correspondents give arrangements of the titles of published stories in the order of what they think is their merit. We do not regard letters like yours as discouraging, but rather feel that they contain healthy criticisms, and help us on our way, because we feel there is genuine interest behind them.—EDITOR.)

A LETTER OF EXCELLENT AND HELPFUL CRITICISM

Editor, AMAZING STORIES:

Being a mere "infant" in the realm of science, I realize that my voicings will not hold a great deal of "thunder," but even the tiny babe likes to be heard, to give vent to his "fussings."

First, I would like to take advantage of your "reader's vote of preference."

I did not care much for the story, "Beyond the Green Prism." This statement is liable to cause a great avalanche of scorn to be poured down upon me, because it was virtually in answer to a request for a sequel to "Into the Green Prism." I did not read the latter, so I may not know what I am talking about. When I say I did not care much for it, I mean that it was not as fascinating as the general run of the tales in AMAZING STORIES. It seemed to me to be lacking in real honest-to-goodness action; the element of suspense was also lacking, in my opinion.

Now for "The Corpse that Lived"; as a story it was fine, but as an amazing story it lacked the amazing element, although there were some very ingenious suggestions of the future. As a love story it was good, but please do not let your "Mag" "go to the Cupids," although the intwining of love with scientifiction puts more realism into the stories.

"Air Lines" seemed to be "smeared" gaudily with love also. Not that I am opposed to love, for being a young man I am not immune to human instincts, but I do not fancy the element of love dominating that of science.

Having exhausted my vocabulary in "knocks" I will now try to redeem myself.

"When the Atoms Failed" was good. Why I liked it I do not know, unless it was because of scientific facts and possibilities mixed with plenty of action.

I cannot see why some "critics" pick some insignificant impossibility and proceed to give their reasons why it is impossible. If it were not for the seeming impossibilities, your stories would surely be of dry texture. Although the known facts should by all means be given correctly, there should be no restriction on the imagination of the far-reaching statements and suppositions which constitute the greater part of your stories. For instance, why should the life of another planet be discussed according to the laws of this world, for the theories of science are constantly changing?

"The Sword and the Atopen," "The First Ornithopter," "Fourth Dimensional Space Penetrator," and "The Hungry Guinea-Pig" were all interesting as well as instructive.

Cecil Dimick,
Heiner, Utah.

(Your criticisms do not read as if you were a mere infant in the realm of science. We are delighted at the points of view which you take. There is a little love which comes into our stories now and then, but really comparatively little and the idea of only putting in absolute scientific possibilities would do exactly what you say—it would reduce our material to a dead level of dryness. The imagination has been often assumed and believed to be very important in scientific investigations and we hope that our magazine, far from preventing anyone's efforts to use their imagination, would encourage them in it in accordance with the line of criticism which you give in your very interesting communication. Imagination is almost the first thing in original scientific investigation—then in the laboratory, you can test and prove out your imagination and see what it comes to.—EDITOR.)

FEARS "LOVE AND ROMANCE" IN A. S.

Editor, AMAZING STORIES:

S-a-y, how much better is our magazine going to become? When I read the March copy (the first I had read since the magazine changed management), I thought it A-1 in the superlative degree. However, the two succeeding issues, namely the April and May, were still better in my opinion. I cannot conceive of any improvement in the May issue, every single story went over big with me and if I can tell anything by the authors, the June copy is going to be even better (if possible). And now I am going to grade the stories in the aforementioned issues according to the accepted standard:

Excellent—"The Metal Horde," "Remote Control," "The Conquest of the Earth," "The Green Girl," "The Gimlet," "The Universe Wreckers," "The Ivy War."

Good—"Rhythm," "The Feathered Detective," "Synthetic," "Madness of the Dust," "A Circe of Science."

Fair—"Through the Veil," "The Noise Killer."

Poor—None.

Your best authors are Dr. Keller, John W. Campbell, Jr., A. Hyatt Verrill, and Edmond Hamilton. I would like to know if John W. Campbell, Jr., is the same as John C. Campbell, Jr.; also, if Leslie F. Stone is a man or a woman. In your answer to Mr. Willbank's letter, which was printed in May A. S., you stated that more love and romance were to be injected into the stories. This was quite a setback to me just as I was congratulating myself on finding a scientific magazine in which the love and romance element kept it's proper place in the dim background. I hope "our" magazine will not be thus lowered to the level of the other magazines which clutter up the newsstands.

Wayne D. Bray,
Campbell, Missouri

(You praise us so highly in your letter that we hesitate to publish it. Appreciation by the readers of AMAZING STORIES is a great asset from the editors' standpoint, for we are certainly trying to make it good. John W. Campbell, Jr., is not the same person as John C. Campbell, Jr., and Leslie F. Stone does honor to it by being a member of the interesting weaker sex. You need not be afraid that love and romance will not be kept in their proper place in A. S. We certainly plan to maintain our policy of publishing only scientific fiction.—EDITOR.)

THE PAPER AND COVER OF AMAZING STORIES

Editor, AMAZING STORIES:

As a steady reader of AMAZING STORIES Magazine, both monthly and quarterly, I have this suggestion to make, which you may accept at its worth.

As a public school teacher, there is a certain literary standard to which my friends and acquaintances expect me to live. The contents of your AMAZING STORIES are well up in this standard, but the paper on which it is printed and the shrieking covers are simply atrocious. To me, and to many of those who read your magazines, the appearance of them smacks entirely too much of the cheap, tawdry, ten-cent fiction to be found in every illiterate person's hands.

Why not put a respectable-looking cover on your magazine, and print it on some half-way decent paper? It will appeal quite as much to your readers and will stop them from hiding the magazine in a cover or envelope, in order not to have people think they are reading some silly piece of cheap trash. I trust that you will give this suggestion some serious consideration.

Rose A. Napoleon,
2654 E. 12th St.,
Brooklyn, N. Y.

(We can only say that we wish you knew how much thought and care is given to the cover pages. Each one is supposed to depict an incident in one of the stories and the nature of the stories is such that at first sight the covers may seem, what you call "shrieking." But take the trouble to study the cover, and you will change your mind. The paper which we use, being free from glossiness, is particularly good from the standpoint of preserving the eyesight. We are looking forward to the time, which we hope is not in the

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too distant future, when we can put A. S. across as one of the definitely high grade and literary magazines. We will, if our readers continue to stand by us and help.—EDITOR.)

A LETTER FROM THE BACKWATERS OF CIVILIZATION

Editor, AMAZING STORIES:

The October and November numbers arrived O. K. and we have had much pleasure in reading the same. You may count on me as a regular subscriber from now on. AMAZING STORIES should be more read in Western Canada. It is not on sale in the small towns and villages, and I am sure it would have a large market if it were pushed here. You know it is said anyone who does anything a little better than anyone else will have a beaten path to his door, but we must have in mind that the world has to be informed of the fact or else *how are they to know?*

I consider AMAZING STORIES not only proves most interesting reading but it also has an educational value. And it would be advantageous if every boy in Canada read the magazine. To say the least, the stories are clean and tend to interest the imagination which is a very desirable tendency indeed.

I notice some of your readers do not appreciate your reprints of Jules Verne and I just wonder if in reality his stories are now out of date or has our literary appetite become depraved, as it were, through reading the trash the reading market is flooded with these days? We are overwhelmed with wild west *Cow Boy Killer Stories* which are anything but good reading for the young folks as were the *Buffalo Bill* and *Deadwood Dick Stories* we read in England 30 years ago and they were then regarded as *Blood and Thunder.*

I think I have read nearly all of Jules Verne's works and should dearly love to once more read many of them, but many are now out of print and when we read them again, we may be disappointed, as after all most of our desires fall short of our anticipation when we realize them; something always mars them more or less.

Yet I should like to test the matter and my boys might like to read Jules Verne's stories, the satisfactory ones. Are there not several of them in print in North America?

How about stories of A. Lawne? His "Conquest of the Moon" and the "Mystery of Ecbatana" and the "Romance of Two Worlds" by one Corelli? Why not Ceazer's Column, Max Pemberton's "Iron Pirate" we used to enjoy when a boy? Frank Reid's stories—we never hear of them now.

I note many readers would like the name AMAZING STORIES changed to AMAZING SCIENTIFIC. Why not please one and all?

In 1903, we, here in Canada, could get American magazines at the same price as they were delivered in U. S. A. but now there is an extra postage charge. It is a boycott on good reading.

Has science ever dealt with Latent Cold? This is not perhaps just the most adequate definition, it might be better to write Speed of Cold. The thermometer shows us ordinary temperature, but we all know who have experienced the chilly effect of a few winds which only affect the thermometer a degree or two, that that latent speed cold affects us in a positive manner. Another scientific phenomenon that has always interested me is the action of the gyroscope and I can see some possibilities, not some new factors, to discuss and having kept the following idea under my hat for 30 years, consider it high time to hand it over to you, Mr. Editor, to suggest that one of you construct a story based on this. I am not situated where I can make experiments on one hand nor have I ability to write fiction. I am not a mathematician and my transmission will not mesh in with Einstein's formulas and differential calculus, and though I was rather good with a 12-gauge shotgun and rook rifle I am not versed in trigonometry, and, living here in the backwaters, new ideas filter through my mind but slowly.

My idea is to make a compound gyroscope, that is, two heavy wheels, one within the other and at right angles to one another and of equal mass, then setting them to sun on the dual spin and devise means to both vary the mutual speed and vary the speed of each in relation to the other. In that way, we might get a new means of locomotion that would overcome the action of gravitation. Get the idea?

Another idea that could be used to build AMAZING STORIES is an "Internal External Combustion Motor," in which the fuel is burned under constant pressure, constant temperature, at constant volume, and then led as required from the container or generator to the cylinders of the

motor. The above carburetor and ignition are all done away with.

I never knew until I read AMAZING STORIES that the action of a rocket is not based on atmospheric pressure and I do not even now just grasp the point.

Walker Hodgson,
Melville, Sask., Canada.

(We agree with you that a good story could be based on the curious instrument, the gyroscope. We could give a quantity of Jules Verne's stories, and already have given a number, but some of our readers write us that the Verne stories are old-fashioned and fail to interest them. Some of them are of a higher order of merit than others. In "The Voyage to the Center of the Earth," which we published some years ago, Jules Verne in the beginning gives us a description of Iceland which is astonishingly good. He never did much traveling, but he certainly could describe scenery marvelously well. In the internal combustion motor, the pressure is produced and the pressure is at its highest when the gases are hottest. Your idea of exploding them and then drawing upon them later would not work. Elsewhere we say something about the rocket, so we need not repeat it here, except to tell you that the action of the rocket does not depend on the air surrounding it and it would go better if there were no air.—EDITOR.)

A VERY APPRECIATIVE LETTER ABOUT SOME OF OUR STORIES

Editor, AMAZING STORIES:

I am writing to tell you how much I enjoyed the February edition of your magazine. It gets better every month. I hope this long-thought-out digest of your stories will help you.

"Explorers of Callisto" is a very good story as far as it went. I thought it was cut off in the most interesting part, making it seem incomplete.

"The Twentieth Century Homoculus" was pretty fair, but not up with your best, as it records failure of science.

"The Ice Man" was highly fantastic and is some of the best comedy that you have printed. It is comparable to that famous series, "Hick's Adventures With a Kick." I haven't laughed so much in months. I had the whole family laughing with me at "Marcus Publius" birds' eye view of twentieth century femininity. Apparently, he enjoyed the short skirt fad, and I suppose we would find him mourning the long skirt fad that has supplanted it. Fickle woman, from one extreme to another. A good comic like this one adds spice and pep to the magazine. How about one a month?

"The Man From Space," A beautiful story, but I wish Bob's dream had lasted a little longer. Hansen writes good stories and I find some of his descriptions somewhat similar to Verrill's.

"The Radio Robbery" was just good. It could have had more explanation in it. It left a lot to the imagination.

"Vitamine Z" was entrancing. I pity both Dr. Beardsley and the world. He lost his life while we lost his great discovery. I hope we have more stories by Dr. W. Lemkin. I enjoyed "Cold Light" by the same author.

"Beyond the Green Prism" just another Verrill success. If your whole magazine was just composed of stories by Verrill, I think it would be as good as it is now. I hope his next story is a fantasy such as "The Moon Pool." Such descriptions! We seem to be in those scenes of magnificence, whose beauty takes our breath away and we live and breathe the stories we read. Do not lose Verrill.

"Into the Valley of Death" a few tingling minutes of breath-taking adventure in Death Valley. It ended just right for a short story.

I hope your magazine continues just as good as it is now. I hope you will continue to give new authors a chance as you have discovered a lot of good talent. Keep *our* magazine superior to competitors.

Kenneth Treeby,
137 Ryan St., Buffalo, New York.

(Your comments are very flattering. There is one thing we do want to say. We observe that you admire "The Ice Man." This was a story which we enjoyed greatly. The humor in it, we feel, was expressed without degenerating into anything like boisterousness and the little sarcastic touch which pervaded it was most delightful. It reminds us of Edgar Allan Poe, who in "Some Words With a Mummy" and in "The Thousand and Second Tale of Scheherezade" also gives some of his views about things in modern times. Curiously enough we have received a letter from a correspondent who is absolutely indignant about this story. We have printed the other letter in a previous issue.—EDITOR.)

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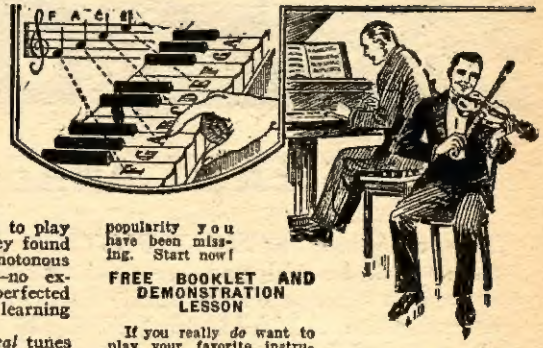

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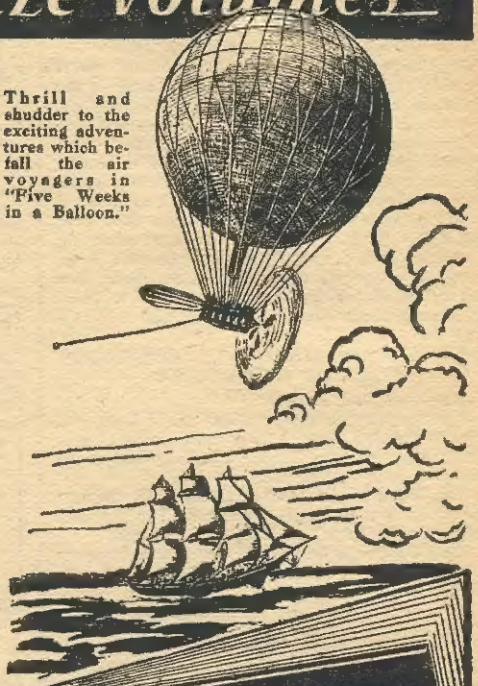

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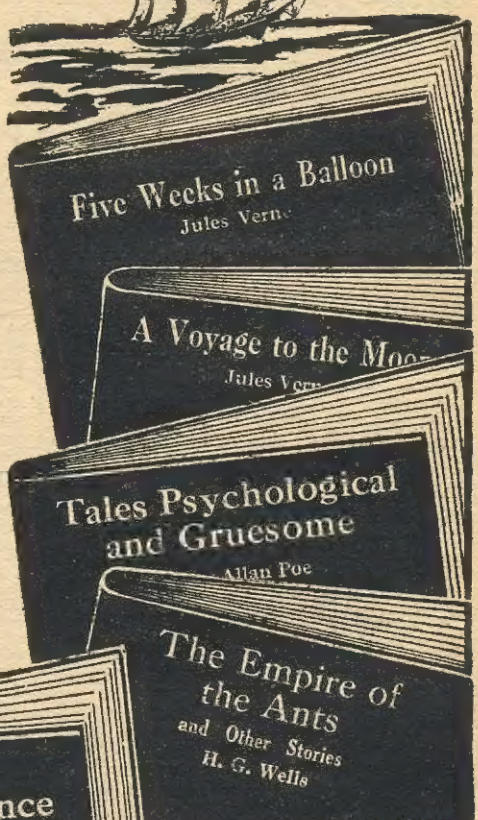

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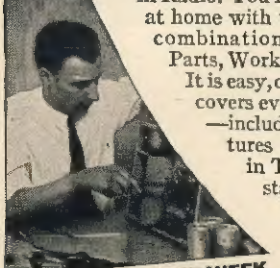

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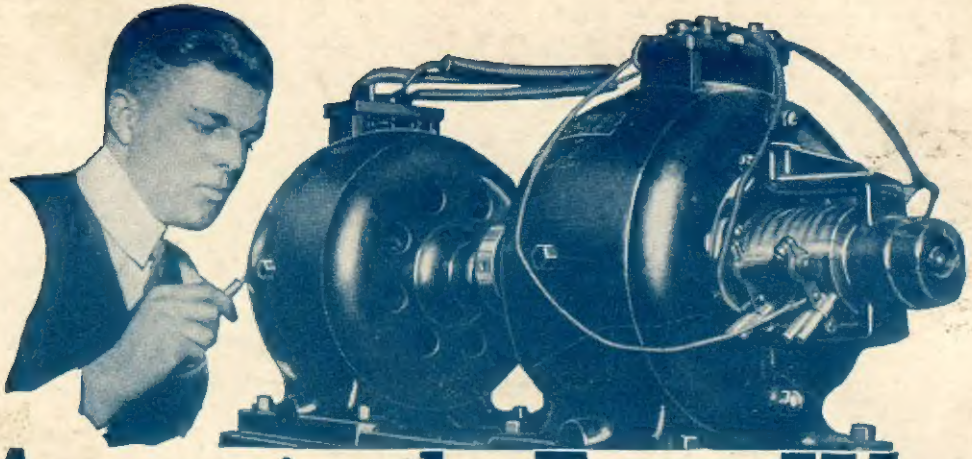

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